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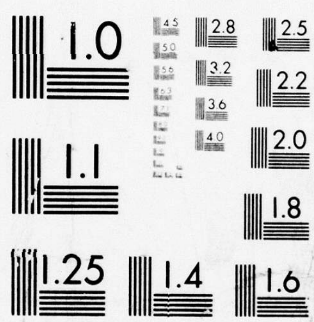

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A METHOD FOR AUGMENTING THE
ADVANCED CONFIGURATION MANAGEMENT
SYSTEM FOR NATIONS OPERATING F-4
AIRCRAFT UNDER THE UNITED STATES
INTERNATIONAL LOGISTICS PROGRAM

Gordon F. Boswell, Capt, USAF
Thomas E. Distelhorst, Capt, USAF

LSSR 23-77A

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The F-4 Technical Coordination Group (TCG) at the Ogden Air Logistics Center has the responsibility for configuration accounting of F-4s sold abroad under the International Logistics Program. The TCG uses a combination of the U. S. Air Force Advanced Configuration Management System and a manual record-keeping system. The manual system has had to be used extensively due to peculiarities of foreign nations' configuration accounting needs. These manual methods have been very time consuming for the TCG. This research developed a computer model to take the place of the manual system methods. The computer model was found to be a faster method of accomplishing TCG configuration accounting tasks while performing at an equivalent level of accuracy.

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By

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This thesis, written by

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has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

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COMMITTEE CHAIRMAN

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CHAPTER I

INTRODUCTION

STATEMENT OF THE PROBLEM

Presently, there are more than 700 F-4 aircraft owned and operated by foreign nations (13:1). These aircraft were purchased through both the U. S. International Logistics Program (ILP) and the Military Assistant Program (MAP). The level of logistics support, particularly maintenance, needed to keep these aircraft operational has increased as they have aged (13:1).

In July 1972, the Air Staff directed development of a program that would provide manager services for the foreign F-4 users. On 1 July 1976, an F-4 Technical Coordination Group (TCG) was established at the Ogden Air Logistics Center (OO/ALC) to provide a broad range of logistics services, including configuration management, for ILP nations (15:1; 16). To aid in providing these services, the TCG used portions of the U. S. Air Force (USAF) Advanced Configuration Management System (ACMS).

Although the ACMS provides satisfactory configuration management for U. S. Air Force requirements, it is not wholly adequate for monitoring and tracking the configuration of foreign F-4 aircraft. Due to differences between

ILP nations' requirements and U. S. Air Force requirements, a manual records system must be used at the Ogden ALC to augment the ACMS (14:2;16). As a consequence, in the process of accurately managing F-4 aircraft configuration, a great deal of time is spent manually indexing, searching, and listing files. The TCG desires a faster, more efficient system (16).

JUSTIFICATION FOR THE RESEARCH

This section develops the need for the research. It discusses the configuration management function of the TCG, the role of the ACMS, the TCG's configuration accounting problems, the present method of dealing with these problems, and the case for an alternate method. Objectives of the research, the questions that the research was designed to answer, and assumptions concerning the research are presented.

TCG Configuration Management Function

When the TCG was formed, one of its objectives was to monitor the various configurations of F-4 aircraft belonging to the countries using its technical coordination services (13:2). The present countries that have purchased F-4s under the International Logistics Program (ILP) and that also use the configuration monitoring function of the TCG are: Spain, Greece, Iran, Israel, Turkey, and South Korea

(13:Atch.2; 16). These are referred to in the research as the ILP nations.

The TCG is involved with these nations in three areas of configuration management (12:1):

(1) Identification or establishing the description of the baseline aircraft by technical specifications or drawings (12:2),

(2) Configuration control, the process of maintaining the established baseline identification and regulating all changes to that baseline (12:2),

(3) Configuration accounting, the bookkeeping process of recording the status of all changes to the baseline configuration. Configuration accounting gives users of weapons systems a current configuration listing (12:2).

The TCG employs a set of methods to manage F-4 configurations. For identification, the TCG maintains copies of the detailed specifications and Government Furnished Equipment Lists (GFEL) for each model of F-4 that a country has purchased (16). This gives the TCG a record of the initial configuration. Each country accomplishes its own configuration control, or regulation of changes, by either a manual file system or a computerized system. The TCG monitors these configuration changes by maintaining constant communication with the McDonnell-Douglas Corporation (the

prime F-4 contractor), other contractors, and ILP countries using the TCG services. Currently these are: Spain, Greece, Iran, Israel, Turkey, and South Korea. This communication consists of notification letters, telephone conversations, and personal visits (16). The TCG must record changes so that a current listing of the parts and subsystems, and modifications to them, of each country's model series of aircraft is available.

This research was concerned with the process the TCG uses for configuration accounting when it is notified of a change to a country's configuration of F-4s. Currently, the TCG accomplishes configuration accounting by combined use of the ACMS and manually recorded files (16). The following discussion deals with the ACMS and why it does not fully meet the TCG's configuration accounting needs.

Advanced Configuration Management System (ACMS)

The ACMS is used by the USAF to account for the configuration status of certain equipment (12:1). The F-4 is one of the items it is used for. The ACMS is designed around automatic data processing equipment. The data system for the F-4 aircraft (referred to as the DO57G data system) contains a master file of tables and indexes containing identification and applicability of all F-4 Time Compliance Technical Orders (TCTO's). The master files for the F-4

contain 529,627 records which are maintained and continually updated by the F-4 System Manager Office. Twenty-eight different reports from this data system are used to determine F-4 configuration, the TCTO's or modifications accomplished or outstanding on individual aircraft, and the TCTO status or related manhours used for any given organizational level within the U. S. F-4 Force. These reports are also used to program depot repair efforts (12:1).

While there are twenty-eight F-4 reports used by the F-4 System Manager Office, only four are applicable for TCG configuration accounting use (16):

(1) DO57G 951A, Class IV Modification Summary Report. This is a quarterly summary of mission-essential modifications for each model F-4 (16),

(2) DO57G 901B, ACMS Selected Article Configuration Status Report. This quarterly report gives the current TCTO status and modification history of F-4 aircraft by serial number and base (16),

(3) DO57G 801E, ACMS TCTO Master Record Report. This is a quarterly report showing complete information on all approved and current TCTO modifications (16),

(4) DO57G 801F, ACMS TCTO Permanent History Record Report. This is a quarterly record of all accomplished TCTO's on individual aircraft (16).

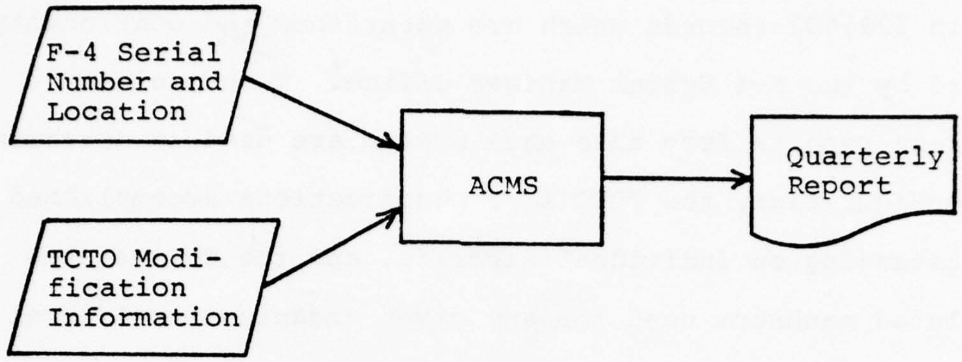


Figure 1-1. ACMS System Flow

The TCG uses these ACMS reports to monitor USAF-approved modifications (TCTOs) that individual countries have adopted (16). The ACMS covers only USAF-approved modifications, however, and situations exist that are not covered by the ACMS (16).

TCG Configuration Accounting Problems

One situation occurs when the *original baseline* configuration of an ILP nation's F-4 differs from a U. S. baseline aircraft. Almost every ILP nations' F-4 configurations have some differences from USAF F-4 configurations, requiring that different detailed specification books be kept by the TCG (14:2; 16). A second case occurs when a proposed modification (which can result from USAF findings, non-contractor industrial proposals, etc.) is disapproved by the USAF Configuration Control Board for USAF adoption. A foreign nation could be offered the same modification from

an industrial source and accept it. The ACMS would not carry a record of such modification (16). A third situation occurs when a foreign country retrofits its aircraft with a foreign-made subsystem not contained in USAF aircraft (16). Due to these situations, the TCG is concerned with monitoring parts and modifications beyond the scope of the ACMS.

When a modification is proposed by some industrial source that could affect foreign aircraft, the responsible technician frequently queries the TCG to find how many aircraft would be affected. Also, when a modification is adopted by the USAF or proposed by an industrial source, the TCG needs to know how many aircraft in which countries could possibly be affected (16).

There are three reasons why the TCG performs configuration accounting in this manner. First, many countries use USAF technical data as a basis for their own technical publications and need to be appraised of changes, particularly for safety reasons. Second, sale of modifications to other nations helps the U. S. balance of payments and helps amortize contractor costs among a larger market, decreasing USAF costs. Third, certain modifications may affect mission capabilities, a factor the USAF needs to be aware of for planning allied operations or defense (16).

TCG Manual System

To accomplish configuration accounting for the ILP countries, the TCG has used a manual system of filing and retrieving information. This system is used to track non-USAF modification status and to assess the number of a given part possessed by a country. When a non-USAF-approved modification is reported adopted by a particular nation, a record of the modification and proposed (and later, actual) completion date is filed, including nations and individual aircraft serial numbers affected. To accurately assess configuration status of particular nations' aircraft at a later date, these files must be searched and counted (16). This process is shown in Figure 1-2. When a modification to a subsystem is proposed, the proposing service (depot, private industry, etc.) may request TCG assistance. A thorough search of the detailed specification books for each aircraft model in each country must be made by the TCG to determine how many aircraft in what country might be affected. The files of subsequent modifications must also be searched to discover which aircraft have been changed from the original specifications. A subsequent report is made to the proposing service (16). This process is shown in Figure 1-3. Both tasks may often take from eight to twenty-four manhours for the TCG staff to accomplish (16).

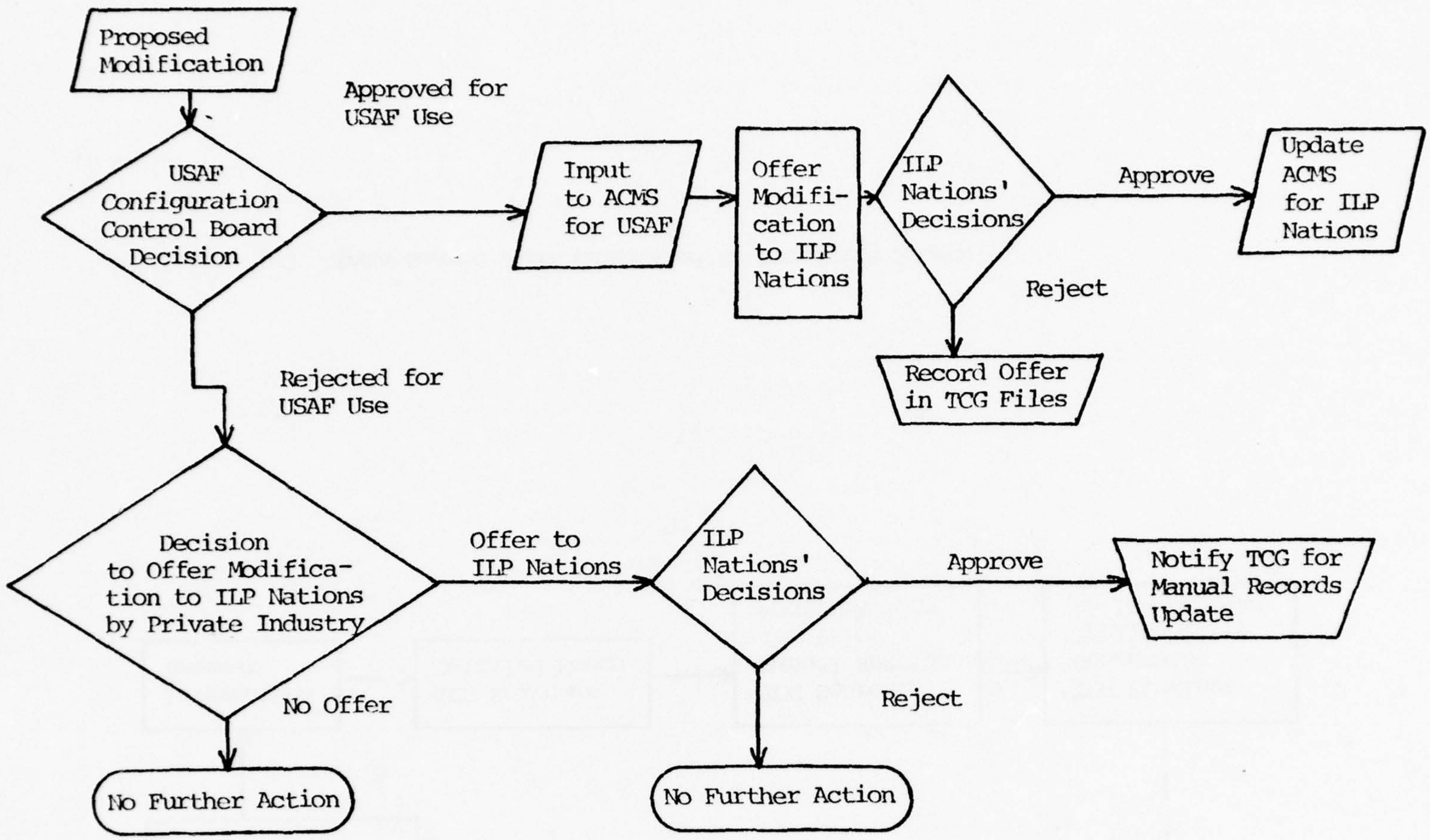


Figure 1-2. TCG Data Input Flow

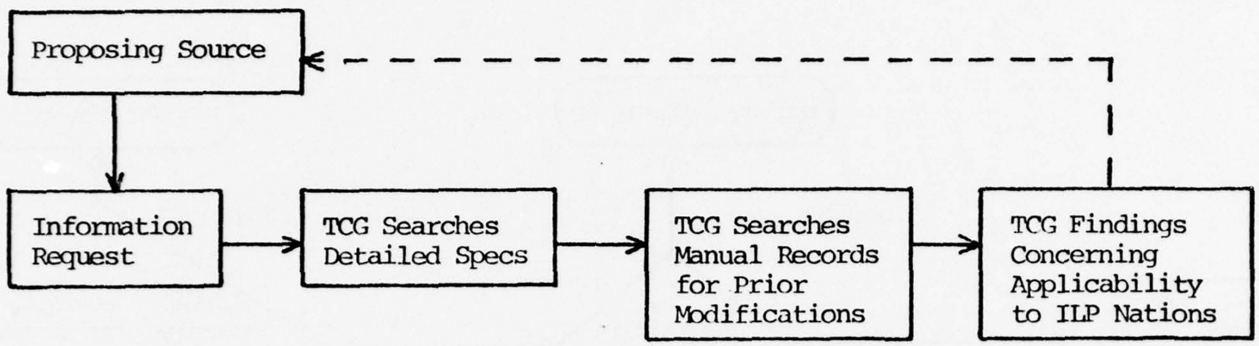


Figure 1-3. Data Search Flow (Initiated By Proposing Source)

Each foreign nation accomplishes its own configuration accounting as well. Though there exists some computer capability within the ILP nations, many have a completely manual system for recording and accounting for status of modifications (16). In order for the USAF to monitor allied configuration status and provide a full range of technical services to foreign military sales customers, the TCG performs its own configuration accounting tasks and must utilize this manual system (2:1).

Capabilities of a Computerized System

The TCG desired a faster method of accomplishing configuration accounting tasks. A computerized system seemed capable of doing this. The speed and memory of a computer permit achievement of greater efficiency in systems through more rapid calculations and sorting ability (11:17-18; 8:42).

The task of the TCG appeared analagous to the accounting and inventory problems that have been successfully computerized by many organizations. The USAF ACMS is just such a case, allowing rapid assessment of operational readiness and the ability to assess the scope and cost of modifications (16;17).

The TCG currently saves time by using this system for researching USAF-approved modifications (16). Extending the capabilities of the computer to the tasks of researching

non-USAF-approved modifications and researching applicability of proposed modifications could further enhance the TCG's efficiency. A computerized method of speeding up the sorting and recording of information was therefore considered worthy of development and testing.

RESEARCH OBJECTIVES

At the outset of the research, three objectives relating to developing and testing a computerized model of the present manual system were set forth:

1. Develop a computer model that will provide the information necessary for the TCG to accurately accomplish selected representative configuration accounting tasks.

2. Develop the model so it can be expanded to include the entire range of parts and modifications that the TCG monitors.

3. Test the model to determine if the representative tasks are performed more rapidly than with the present manual system.

RESEARCH QUESTIONS

The following questions followed from the research objectives. The questions were posed in this manner.

1. What elements of input and output are necessary to develop a computer model for configuration management support of the ILP?

2. What technique should be used for programming the model?

3. What model is most appropriate?

4. Is the model valid?

5. What would be required to expand the model?

6. Does the model perform tasks faster than the present manual system?

ASSUMPTIONS

Certain assumptions were made at the beginning of the research in order to define the problem and were used in answering the research questions and objectives:

1. The research was confined to the configuration accounting function of the TCG. It was assumed that identification and configuration control are exercised by the individual country with adequate communication between the country, TCG, and the contractor.

2. It was assumed the data collection procedure of the TCG would not be changed. This would have required a procedural change outside the scope of this research.

3. The interpretation of the work of the TCG was assumed to remain the same.

4. It was assumed that the model proposed would not be considered developed until it was capable of producing information the TCG required at an equivalent (or higher) level of accuracy than the present system.

5. It was assumed that due to the computer capability between the Air Force Institute of Technology and Ogden ALC, the cost of implementation of a successful model would be minimal.

6. Time was assumed to be the major item of comparison of efficiency between a successful computer model and the present manual system.

Once research objectives were clarified, research questions developed, and the necessary assumptions made, methods for accomplishing the objectives had to be developed. These are outlined in Chapter II.

CHAPTER II

METHODOLOGY FOR MODEL DEVELOPMENT AND TEST DESIGN

INTRODUCTION

Due to the nature of the objectives, the research consisted of two phases. First, a computer model had to be developed that would provide proper information to the TCG and that would be responsive to operational data. Second, the computer model had to be tested against the manual system. This chapter will explain what the model consisted of, the proposed method of model development, and the type of testing determined appropriate.

MODEL DEFINITION

The name, ILP Advanced Configuration Management System (ACMS), was given to the computer model devised to replace the manual system. The ILP ACMS would consist of inputs, a process, and outputs. Once this model was developed, tested, and accepted by the TCG, it could be expanded into a fully operational system to replace the manual system.

Inputs

The input for the ILP ACMS was to consist of data collected by the TCG for ILP nations F-4 configurations.

The data used to develop inputs would be obtained from: (1) TCG files and records of ILP countries and aircraft, (2) current ACMS listing of applicable USAF-approved modifications, (3) codes developed by the USAF for parts and subsystems, (4) codes developed by the TCG for non-USAF-approved modifications, (5) TCG records of previous tasks, (6) detailed specifications for various models of F-4 aircraft, and (7) opinions of TCG personnel. These inputs were all to be considered for application in developing the model for accomplishing the configuration accounting tasks of the manual system.

Process

A process was to be developed to insure the proper information for a particular configuration accounting task was gleaned from the input data. Computer programs were to be written that would search the files of input data, find the necessary information, and present it as output. One program would concentrate specifically on searching for a given part, counting the amount, and give any remarks stored in the files. A second program would perform the same functions for modifications.

Output

Useful output was determined to be an essential element of the ILP ACMS. Research has shown that many information

systems fail because they have an overabundance of irrelevent information (1:179). The emphasis on generating, storing, and retrieving all possible data may lead to the manager getting many things he does not need. The real emphasis should be on filtering and condensation (1:179-180). Also, models should concentrate on outputting the information that directly affects decision making (1:80; 3:199).

The output was to consist of the information necessary for the TCG to perform the tasks of configuration accounting. The concept of what this output should be was slightly different for each program. The program researching parts would print out a number by country and model of the parts in inventory and remarks such as nomenclature or sources. The program researching modifications was to identify the countries and models that the modification applied to, note the completion status for the model group as a whole, and list remarks applicable to that modification. Both sets of output, as well as a computer list of any file, would be structured for a time-sharing teletypewriter.

TCG personnel were to be able to ask for a part or modification to be researched and receive a rapid answer in an easy to read format. Plans were made for confirming proper output with the TCG, refining the input data, and developing the computer programs.

METHOD OF DEVELOPING THE MODEL

User Discussions

Discussions with TCG personnel were scheduled to determine specific output requirements and input methods. The main purpose of the discussions was to identify the necessary information for TCG use and develop a format for presenting it. These discussions would also aid in defining proper output, input sources, and the means to be used in building the initial files. After ILP ACMS development, later discussions would assess the usefulness of the model.

Expert Opinion

To determine an appropriate files structure and computer technique for the process, the expertise of personnel in the Air Force Institute of Technology Academic Development and Support Division (AFIT/AD) was to be solicited. These discussions were to lead to the design of the various files and programs which would make up the ILP ACMS.

METHOD OF TESTING THE MODEL

The third research objective set forth in Chapter I stated that the ILP ACMS, when developed, was to be tested against the manual system. This section discusses the

design of this test, the criteria for success, and explains the statistical test that was applied.

Design for Testing

The testing was designed to compare completion times for the two different systems (manual and computer) required to accomplish different problems the TCG was faced with. Discussion with the TCG had established that these could be grouped into three tasks (16).

These tasks consisted of (1) changing and reprinting parts lists for each country and model of aircraft, (2) given a particular part code, researching information about it, and (3) given a particular modification, researching its status. These are shown in Figure 2-1 as Task 1 (list changes), Task 2 (part search), and Task 3 (modification search).

Since the times had been recorded for manual solution to the different problems, it was possible for the TCG to compute average times for each type of task. The ILP ACMS would be designed to accomplish the same types of tasks, and a sample of these times was to be used to compute an average time for each task.

Criteria Test

Since development of the ILP ACMS inherently assumed a level of accuracy equivalent to the manual system, and

since the cost to the TCG of development was not assumed to be significant, a reduction in time was used as a criteria for success for the ILP ACMS. A twenty-five percent reduction in time would be the criteria for the comparison.

Statistical Test

In addition to the criteria test, a test of statistical significance between times for the manual system and the ILP ACMS was also possible. The particular design of the comparison made an analysis of variance (ANOVA) test possible between the performance of the manual system and computer model for the three different tasks. Performance was to be based on average time for each to complete the different task categories.

To illustrate this, the results of the time comparisons were to be displayed in this manner:

	Task 1 (list changes)	Task 2 (part search)	Task 3 (mod. search)
Manual System (A)	Avg. Time (A1)	Avg. Time (A2)	Avg. Time (A3)
Computer Model (B)	Avg. Time (B1)	Avg. Time (B2)	Avg. Time (B3)

Figure 2-1. Format For Time Comparison

ANOVA is a powerful statistical method. It can provide the basis for determining if several means differ significantly (6:456,476). In this design the means would be the

means of the three average times for each row; A1, A2, and A3 for the manual system, and B1, B2, and B3 for the ILP ACMS.

The analysis of variance between the means for row A and row B was to be accomplished by computing the mean square effect of rows (MSR) by the following formula (6:461):

$$MSR = \frac{\sum_i \sum_j n(\bar{x}_{i.} - Z)^2}{r - 1}$$

where $i = 1, 2$ (or row A and row B)

$j = 1, 2, 3$ (or column 1, 2, and 3)

$n = 3$ (number of columns)

$r = 2$ (number of rows)

$$\bar{x}_{i.} = \frac{A1 + A2 + A3}{3} \text{ for } i = 1$$

$$\frac{B1 + B2 + B3}{3} \text{ for } i = 2$$

$$Z = \frac{A1 + A2 + A3 + B1 + B2 + B3}{6}$$

The variation within the values in the comparison figure are the mean square errors (MSE) and would be computed by the following formula (6:462):

$$MSE = \frac{\sum_i \sum_j (x_{ij} - \bar{x}_{i.})^2}{r(n - 1)}$$

where i, j, r, and n are as defined above and

$$x_{ij} = A1, A2, A3 \text{ for } i = 1 \text{ and } j = 1, 2, 3$$
$$B1, B2, B3 \text{ for } i = 2 \text{ and } j = 1, 2, 3$$

$$\bar{x}_{1.} = \frac{A1 + A2 + A3}{3} \text{ for } i = 1$$

$$\frac{B1 + B2 + B3}{3} \text{ for } i = 2$$

The ratio of MSR to MSE is an F statistic and can be compared to a critical F value contained in standard mathematical tables (6:461-465).

Depending upon the risk level (of being wrong) the F statistic can be compared to the critical F value. The null hypothesis in this type testing is that the row means are the same, and the test is a one-tailed F-test. If the F statistic is greater than the critical F value, the null hypothesis may be rejected, and the row means are considered significantly different from each other (at the given risk level). If the F statistic is not greater than the critical value, the null hypothesis may not be rejected (6:461-465).

Assumptions for using the ANOVA technique were that (1) each average time was independent for each category (column) and system (row), (2) the populations of categories and systems were normal with a constant variance (6:458;16), and (3) the times recorded by the TCG were

accurate. The significance of time differences were to be judged at a ten percent level of risk of error (6:463-468). The critical F value for this was 4.54 (6:847). The test of statistical significance was to be made to add emphasis to the outcome of the criteria test.

SUMMARY

This chapter has identified the elements of the ILP ACMS, the computer model that was proposed as an alternative to the TCG's manual system. The methods proposed for developing this model were presented. The criteria test (for a twenty-five percent reduction in time) and the statistical test (ANOVA, with a ten percent risk factor) were described. The next two chapters will report on how the ILP ACMS was actually developed and the results of the comparison tests, respectively.

CHAPTER III

PROGRAM DEVELOPMENT AND VERIFICATION

INTRODUCTION

This chapter traces the definition of the output information and input data and the development of the computer programs that were written to provide the output for the ILP ACMS. The discussions held with the user (TCG) and programming experts are summarized. The process portion of the ILP ACMS and the verification of the programs making up that process are explained.

TCG DISCUSSIONS

Model Requirements

Discussion with TCG personnel confirmed the requirements for accomplishing configuration accounting tasks. Given a particular part code, a need existed to quickly determine which country possessed it and in what quantity. In addition, the TCG wanted to be able to quickly list the parts belonging to a particular country's model aircraft. Similar requirements existed for modifications (USAF-approved and others). Given a particular modification, the TCG had to know which country was installing it

and what the completion status was. A requirement also existed for updating numbers of parts, modifications, and aircraft as conditions changed with time (16).

Output Requirements

To accomplish these requirements, the TCG determined that the following elements of information were necessary: (1) a listing of which countries, and which models within that country, possessed a given part or subassembly, (2) a listing of parts and subsystems for a country's configuration by model (for example, the parts on Israel's F-4Es), (3) a listing of modifications applicable to each country's aircraft models, (4) a listing of modification acceptance or rejection by country, and (5) a listing of modification completion dates (13). These items were the output goals of the ILP ACMS. The input sources necessary to achieve this output were then clarified.

Input Sources

The input data which was available to the TCG and applied to the desired output, included: (1) codes for parts and subsystems, (2) codes for modifications, (3) numbers of different aircraft model for each country, (4) completion dates for modifications, and (5) records of countries acceptance or rejection of USAF modifications. This data was obtained from TCG records and current ACMS listings.

AFIT/AD DISCUSSIONS

Discussions with Air Force Institute of Technology Academic Development and Support (AFIT/AD) personnel were held concerning selection of a computer language for the ILP ACMS. Both FORTRAN and COBOL were discussed as appropriate languages for rapid sorting of alphanumeric data (19).

FORTRAN was selected for three reasons. First, FORTRAN was compatible with the time-sharing[1] capability of the Air Force Logistics Command CREATE computer system. This system and its remote time-sharing terminals were accessible by both the researchers and TCG personnel. Second, COBOL was not compatible with the CREATE time-sharing feature. COBOL could only be used in batch processing[2], which required too much delay for TCG purposes. Finally, the researchers were more familiar

---

[1]Time sharing is the concurrent use of a single computer system by many users, each of which has an input/output device and can access the same computer at the same time. The computer gives each user a small but frequently repeated slice of time, so that each user gets almost immediate response (7:16).

[2]In batch processing data to be processed is accumulated over a period of time. The accumulated batch is processed periodically. This method is very efficient, but its use means that there is always a processing delay (7:16).

with the FORTRAN language taught at the AFIT School of Systems and Logistics.

After FORTRAN was selected as the language, the method of filing data in the computer was also discussed with AFIT/AD personnel. The TCG required approximately 500 parts and 200 modifications to be tracked for each of approximately 700 aircraft (16). Since one master file containing all this information could possibly exceed available core space limitations for a single file within the computer, another discussion with the TCG was held (19). This discussion revealed that it was not necessary to track parts and modifications for individual aircraft, but by country and model (16). Therefore, a system of smaller interrelated files was developed by the researchers.

FILE DESCRIPTION

Once a general concept of what the files structure should be was determined, specific fields in each record of the files had to be identified. Files with similar formats were created for both parts and modifications.

It was envisioned that the master files would contain three fields: line number, file name, and number of aircraft possessed as portrayed in Figure 3-1. The master files would be accessed by the main programs (to be discussed later) to determine the order that sub-files

should be searched and to determine the total possessed aircraft. The numbers of possessed aircraft were obtained from the ACMS Configuration Index Report (DO57G901A).

Line Number Field		File Name Field		No. of Aircraft Possessed Field

Figure 3-1. Master File Format

The parts file consisted of the part numbers and accompanying description and remarks for each country by model. Part numbers were obtained from Government Furnished Equipment List Item Numbers. Figure 3-2 shows the three fields which make up the parts files. When a part was to be searched or a list of parts possessed by a country/model was desired, these files would be used.

Line Number Field		Part Number Field		Remarks Field

Figure 3-2. Part File Format

The modification files consisted of modifications pertaining to each country's models. Data concerning numbers of each modification completed or notice of rejection by the country for the modification was also a part of the file. Additionally, a section of the file was reserved for remarks concerning the modifications. This data was constructed from TCG files for non-USAF modifications and ACMS Selected Article Configuration Status Reports (DO576901B) and ACMS TCTO Permanent History Record Reports (DO57G801F). The resultant format and the envisioned fields are shown in Figure 3-3. As with parts, when a modification was to be searched or a list of modifications by model/country was desired, these files would be searched.

Line Number Field		Modification Number Field		Modification Completed Field		Remarks Field

Figure 3-3. Modification File Format

In describing this computer file system, an analogy may be made to a metal filing cabinet drawer as shown in

Figure 3-4. The master file for parts (using parts as an example) is on the front of the drawer. This master file is an index of the files within the drawer. Each file in the drawer pertains to a country's model of aircraft (such as ISR-F4E for Israel's F-4Es) and contains a list of parts and remarks for that model. The master file on the front of the drawer lists the number of aircraft of each country's model. When a search through the drawer for a particular part is made, whenever the part is located on one file, a counter is increased by the number of airplanes listed on the master file. Then the next file is searched for the part until all files in the drawer have been searched. For a list of parts for any country or model, those lists are simply pulled from the drawer. A second similar file drawer exists for modifications. Changes are made by updating the master file for numbers of aircraft and the individual files for new parts or modifications.

SEARCH TECHNIQUE

Once the files were conceptualized, a search technique to obtain the desired output was necessary. Two alternatives were considered. A linear search technique that examined each line of each file sequentially was one alternative. The second was a binary search technique.

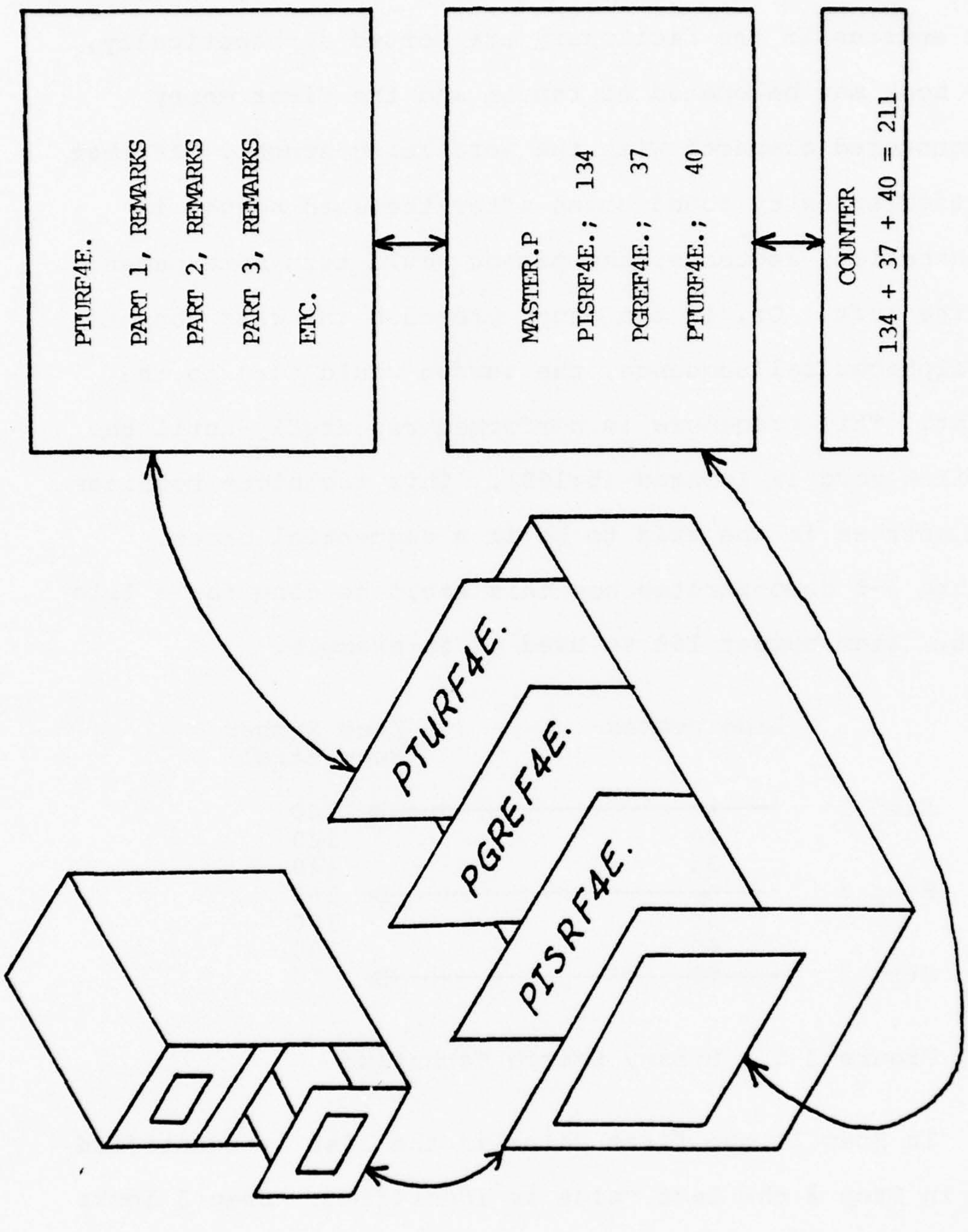


Figure 3-4. ILP ACMS File System

The binary search technique can be compared to a person searching for a word in a dictionary. Knowing that the entries in the dictionary are sorted alphabetically, the book may be opened at random and the first entry encountered compared with the word being sought. If that particular entry found comes after the word sought in alphabetical sequence, the person would turn some pages to the left. Or, if the entry precedes the word sought in alphabetical sequence, the person would turn to the right. This procedure is performed repeatedly until the desired word is located (5:160). This technique requires all entries in the file to be in a sequential order. Figure 3-5 demonstrates how this would be done for a file list. Item number 160 is used as an example.

	Line Number	Item Number (Sequential)
Step 1	10	100
	20	120
	30	140
Step 3	40	160
	50	180
	60	200
Step 2	70	210

Figure 3-5. Binary Search Technique

In Step 1, the first value in the list is identified and in Step 2 the last value is identified. Step 3 looks

at the middle value and compares it to the value being sought. In this case, the middle value, item number 160, was the value being sought. If this middle value was equal to the value being sought, it would become the first or last value for the next comparison, depending if it was greater or less than the value sought. Thus, a list is halved, then halved again until the value being sought is isolated or found not to be in the file. This is a fast way to search very large amounts of sequential data.

While this is a very rapid search technique, it requires that the files always be sorted according to a pre-selected precedence after each new entry. This becomes a disadvantage when contents of the table change frequently because a new sort is required with each change (5:163). In the case of the TCG, frequent changes are made to the files. Also, the coding system for parts or modifications currently used is not compatible with any particular precedence sequence (16).

The other technique considered, a linear search, simply examines each entry on a file in whatever order the entries are listed. Each entry is compared to the value being sought until that value is discovered. No further comparisons are made for that list (4). This technique is displayed in Figure 3-6. The value sought here is item number 140.

	Line Number		Item Number
Step 1	~~10~~	→	100
Step 2	~~20~~	→	120
Step 3	~~30~~	→	140
	40		160

(Steps continue until desired item number is found.)

Figure 3-6. Linear Search Technique

This technique, though slower than the binary search, does not require any complex sorting routines. The search itself is also easier to program.

Because the amount of data in each file (approximately 500 items for part files and 200 items for modification files) is not particularly large, the time used in a linear search is still short. Since the technique was easier to program, and did not require any changes to the present coding system, it was used in the ILP ACMS.

PROGRAM PROCESS

Introduction

This section describes the structure and function of the ILP ACMS computer programs. Examples of files, master files, and program output are shown. The programs, program flow charts, and instructions for their use are found in Appendices B and C, respectively.

PARTSRCH and MODSRCH Program Process

Two programs were written with the aid of AFIT/AD personnel. The program designated PARTSRCH (see Figure 3-7 for system flow) looks for a particular part by searching the files developed for each country and aircraft model combination. If the part is found, it increases a counter value by the number contained on the master part (named MASTER.P) file. It then searches the next country and model file in order of the listing on the master file. The master file consists of a list of the country/model files and the number of each model aircraft a country owns. The program prints the number of the part as well as any remarks contained in the country/model files. If a country buys more of one model or loses aircraft through accidents or combat loss, the number on the master file can be changed.

The program that searches for a given modification was called MODSRCH (see Figure 3-7 for system flow) and works in a similar fashion. The modification files for a country and model are searched and when a given modification is found, the number completed (also on the file) is noted and divided by the total number of aircraft for the country and model listed on the master (MASTER.P) file. The percent of aircraft with the modification complete, as well

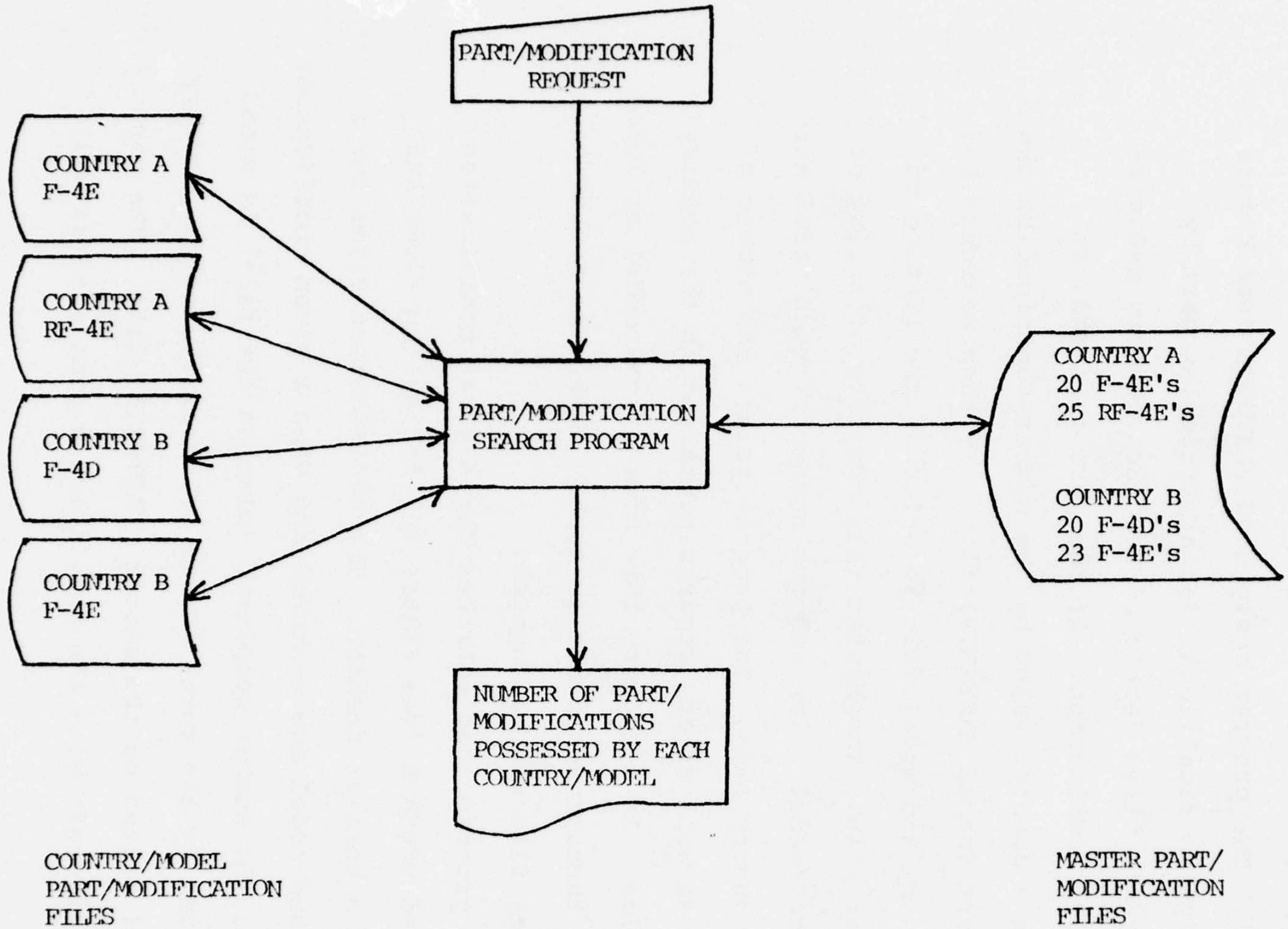


Figure 3-7. System Flow Diagram For Part Or Modification Searches

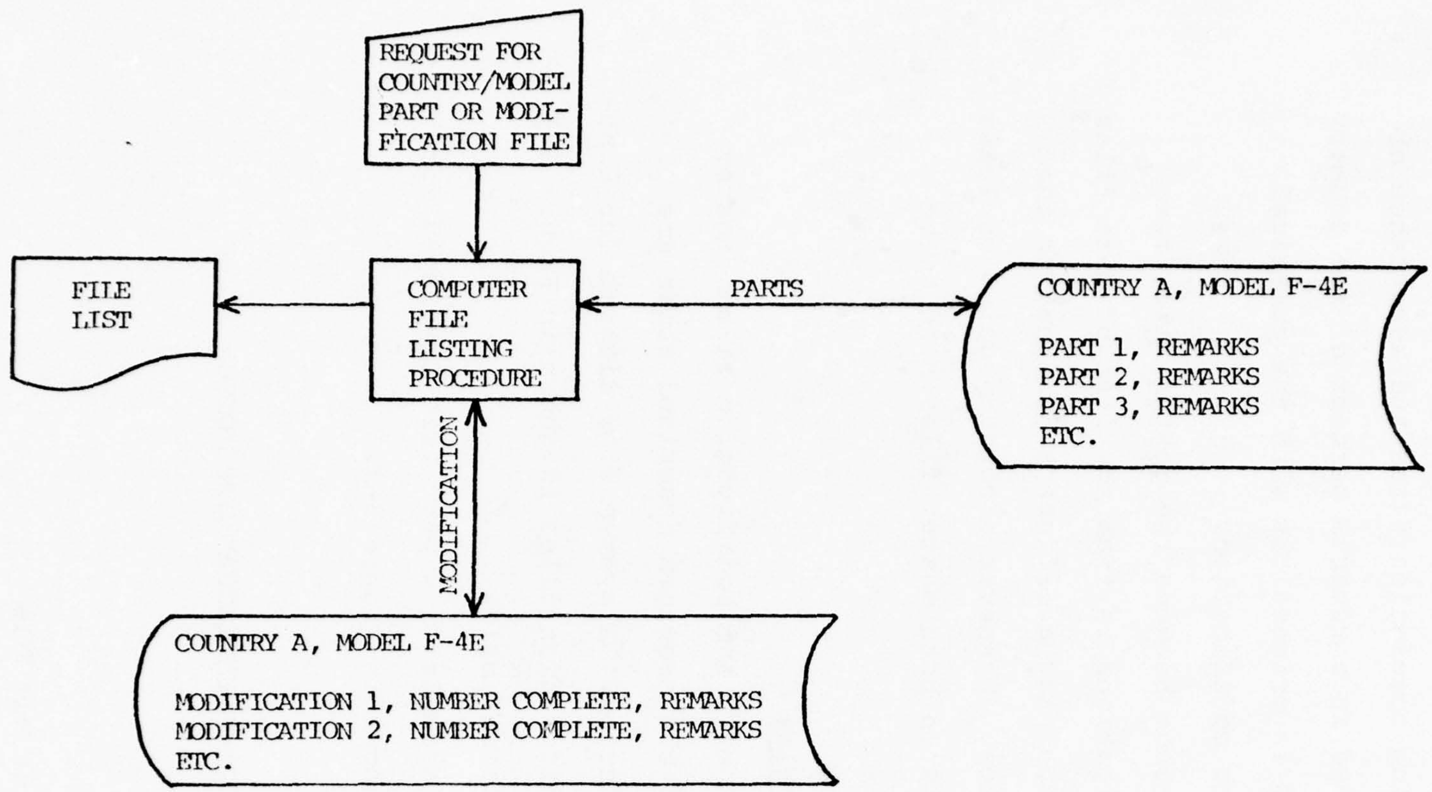


Figure 3-8. System Flow Diagram For Listing Files

as the actual number complete is part of the printout. Information concerning completion dates and acceptance or rejection is contained in a remarks portion of the country and model files, and is printed out with the numerical information about the modification.

The only difference between the master files for parts and for modifications is that the list of part files for a country and model has a different designation than the modification files. Whenever a country gains or loses aircraft, the numbers on both master files need to be changed.

File and Output Examples

Examples of the part and modification files, master files, and output of the programs described above are presented in this section. A system flow diagram for listing the part and modification files is shown in Figure 3-8. These files are explained below.

An abbreviated example of a part file developed for Israel's F-4Es is shown in Figure 3-9.

```
*LIST PISRF4E.

00010   101      J79-GE-17B ENGINE (LOW SMOKE)
00020   201
00030   201-01
00040   201-02
*
```

Figure 3-9. Example Part File

LIST is a computer command to list the file information. PISRF4E. is the name of the file. The first column of numbers are the line numbers of the file, the second column contains the part codes which is followed by a space for remarks.

Figure 3-10 shows a modification file. As with the part files, the file name follows the LIST command. The file name here is MGREF4E. Following the line numbers, in the first column, are the modification codes. The third column reflects the number of modifications complete and is followed by a space for remarks. These remarks may include information concerning modification acceptance or rejection and significant dates.

```
*LIST MGREF4E.

00010   1F-4E-1313    00030 MOD TO EJECTION SEAT, BOUGHT 4/4/74
00020   1F-4E-1314    00015 MOD TO NOSE GEAR, BOUGHT 4/6/74
00030   1F-4E-517     00000 CANOPY SEAL, REJECTION LTR, 2/2/75
00040   1F-4E-2001    00010 APN/78 RADAR
```

Figure 3-10. Example Modification File

The space provided for part numbers (six characters) and modification numbers (twelve characters) was determined ample by the TCG representative (16). These spaces can be expanded if necessary, though at the expense of the remarks section. The file names are limited to eight characters.

Within these space limitations, the TCG is able to assign any file names, part codes, or modification codes desired. The file names used for this research consisted of a P or M as the first character, to distinguish a part file from a modification file. A three-character designation (such as ISR for Israel, TUR for Turkey, etc.) identifies the country. The last four spaces identify the model of aircraft (RF4E, F4E, etc.)[3].

Abbreviated lists of the master files for parts (MASTER.P) and modifications (MASTER.M) are shown below. These files contain the counting values (number of aircraft owned) and identify the sequence in which PARTSRCH and MODSRCH search the files.

```
*LIST MASTER.P

00010  PISRF4E.;  134
00020  PISRRF4E;   10
00030  PGREF4E.;   37
00040  PTURF4E.;   40
```

Figure 3-11. Example Master File For Parts

---

[3]Within the CREATE system, file names are limited to eight spaces. Any blank space is treated as a break in the file name. To avoid blank spaces, periods (.) are used as fillers for those file names using less than eight spaces.

```
*LIST MASTER.M

00010  MISRF4E.;  134
00020  MISRRF4E;   10
00030  MGREF4E.;   37
00040  MTURF4E.;   40
```

Figure 3-12. Example Master File For Modifications

After the programs search the files, the output is generated. An example of the PARTSRCH program output is displayed in Figure 3-13. When a part number is typed into the computer, output consists of the file name (corresponding to the country and model), the number of the parts possessed, and any remarks previously stored in the file.

```
ENTER THE PART NUMBER (NO ENTRY TERMINATES PROGRAM)
=101
PISRF4E.  HAS   134 OF PART NUMBER 101
REMARKS - J79-GE-17B ENGINE (LOW SMOKE)

PISRRF4E  HAS    10 OF PART NUMBER 101
REMARKS - J79-GE-17B ENGINE (LOW SMOKE)

PGREF4E.  HAS    37 OF PART NUMBER 101
REMARKS - J79-GE-17A ENGINE

PTURF4E.  HAS    41 OF PART NUMBER 101
REMARKS - J79-GE-17A ENGINE

THERE ARE 222 OF REQUESTED PART NO. 101
```

Figure 3-13. PARTSRCH Program Output

An example of the MODSRCH program output is displayed in Figure 3-14. When a modification code is typed into

the program, the file (or country and model) that has that modification listed is identified. The output also contains the number of aircraft modified and what the completion percentage is. Room is also provided to list remarks concerning the modification.

```
ENTER THE MODIFICATION NUMBER
(NO ENTRY TERMINATES PROGRAM)
=1F-4E-1313

MISRF4E.  HAS   23 OF   134 MOD.  1F-4E-1313 DONE FOR 17%
REMARKS - MOD TO EJECTION SEAT

MISRRF4E  HAS    6 OF    10 MOD.  1F-4E-1313 DONE FOR 60%
REMARKS - EJECTION SEAT MOD, BOUGHT 4/5/74

MGREF4E.  HAS   30 OF    37 MOD.  1F-4E-1313 DONE FOR 81%
REMARKS - MOD TO EJECTION SEAT, BOUGHT 4/4/74

MTURF4E.  HAS   20 OF    40 MOD.  1F-4E-1313 DONE FOR 50%
REMARKS - EJECTION SEAT MOD, BOUGHT 6/5/74

THERE ARE  79  OF MODIFICATION NUMBER 1F-4E-1313
COMPLETED AND TOTAL PERCENTAGE IS  35%.
```

Figure 3-14. MODSRCH Program Output

VERIFICATION

In designing a computer model, verification is an important step. This may be defined as insuring that the model behaves as the designer intends (18:210). The intent of this model was to produce output that actually contained the information requested by the TCG.

In writing the programs to produce this output, programming errors were sometimes made that caused erroneous output. Correcting these errors, or "debugging" the programs, resulted in output being consistent with what the model should have produced when presented with a known set of input data. To insure this consistency, parts and modifications were identified in the files along with pertinent numbers possessed and remarks. Thus, the proper output was predetermined. The programs were run for these parts and modifications and program output were checked against the predetermined output. When these outputs were the same, the model was considered verified. Once the model was verified it was necessary to determine its validity and to test its value to the TCG. These two areas are addressed in the next chapter.

CHAPTER IV

VALIDATION AND TESTING

INTRODUCTION

Once the ILP ACMS was developed and verified it was then necessary to determine its validity. It was also necessary to test the ILP ACMS to determine if it was significantly faster than the manual system. This chapter addresses both the validation and testing of the ILP ACMS.

VALIDATION

Validity is a test of the agreement between the behavior of a model and that of the real situation (18:210). If the ILP ACMS could produce the same results as the manual system in an operational situation it would be of value to the TCG.

During the development phase of the ILP ACMS, operational data received from the TCG was entered into the part and modification files. During this phase, TCG personnel visited the AFIT School of Systems and Logistics and observed the operation of the computer model. TCG personnel confirmed that the ILP ACMS output was comparable to that achieved by the manual system, and accomplished

TCG tasks considerably faster. Additionally, TCG personnel confirmed that the ILP ACMS was accurate and flexible and would meet the needs of the TCG (16). The ILP ACMS was, therefore, considered valid.

TESTING

Introduction

The analysis of variance (ANOVA) design described in Chapter II was used to test for a significant difference in speed between the ILP ACMS and the manual system. The configuration accounting tasks used for the test, determination of times for these tasks, and test results are addressed next.

Configuration Accounting Tasks

Discussion with the TCG had revealed three major tasks which the manual system of configuration accounting was used to solve. The first task consisted of making changes to the list of parts used by a particular country's models of aircraft (16). If a country, such as Israel, bought a number of parts for its F-4Es, the TCG's listings had to be changed in pen and ink, retyped, and copied. Too few changes made at once created a heavy labor burden. Valuable TCG time was required to search the files, make the necessary changes, and re-file the listings. Past

TCG records indicated the average number of changes made at a given time was twenty-eight (16).

The second task involved researching lists of parts and detailed specifications for each country to determine what countries and models of aircraft used a given part or subsystem. Due to the numerous parts lists and lengthy detailed specifications to be searched this task required considerable time. The average length of time required to search a single part was approximately three hours (16).

The third task involved determining what countries and models had a particular modification and finding the most current status of that modification, including when it was obtained by the country or rejected for use. This task was especially difficult when using the manual system because all modification offers, acceptance or rejections, and current status of modifications required written correspondence. Therefore, all correspondence within a country's record files had to be searched. Approximately thirty minutes were required by the TCG to search a modification (16).

Data Sources for Testing

Once these tasks were identified, it was necessary to establish times to perform them with the manual system and the ILP ACMS. Average times to accomplish each type

of task were supplied by the TCG. Times for the computer model to accomplish each type of task were obtained by changing and listing files, executing the PARTSRCH program and the MODSRCH program, respectively.

The method of accomplishing the first task for the ILP ACMS was to change twenty-eight lines within a file and let the computer print the list. Twenty-eight lines were changed to correspond with the average number used with the manual system. An example of a changed part file is shown below:

Before:			After:		
Line No.	Part No.	Remark	Line No.	Part No.	Remark
10	101	N/A	10	101	N/A
20	102	N/A	20	102-A	N/A
30	103-10	N/A	30	103-11	N/A
40	104	N/A	40	104-15A	N/A

Figure 4-1. Example of Changed File

Line numbers 20, 30, and 40 were changed and the computer listing reflects this.

Eight different files were changed and the time taken by the computer system was nearly the same in all cases. Since the researchers typed the changes themselves and by no means could be considered fast typists, the time for this category could be considered a worst case. The only

other limiting factor was the speed of the line printer. In printing the list a teletypewriter, Model 35, similar to that available to the TCG, was used. The time for the TCG's manual system averaged twenty manhours (16). The average time for this type of task using the time-sharing computer terminal was twenty-five minutes. These times are shown in Figures 4-2, 4-3, and 4-4 for Task 1, changes.

The second task, searching part numbers, was accomplished for the computer system by calling up the program PARTSRCH and running it for a random part number. This procedure was accomplished twenty times, using a different part each time. These twenty separate runs revealed an average time of two minutes for the program to come "on line" or obtain sufficient core space; an average of less than one second to conduct the actual search; and an average of one minute to print the information. The total was three minutes. The average time for the manual system has been two hours per part number (16). These figures are shown in Figures 4-2, 4-3, and 4-4 for Task 2, part search.

The third task, searching modifications, was accomplished for the computer system by calling up the program MODSRCH and running it for a random modification number. Again, this procedure was accomplished twenty separate

times, using a different modification number each time. The average time per trial after twenty trials was three minutes. "On line", search, and print times were the same as for PARTSRCH. The average time for the manual system was thirty minutes (16). These times are shown in Figures 4-2, 4-3, and 4-4 for Task 3, modification search.

Results of Testing

Figure 4-2 shows the average time in minutes for each task obtained using the manual system and the ILP ACMS. Task 1 represents changing twenty-eight lines in a file. Tasks 2 and 3 represent average times to search for a single part number and a single modification number. The ANOVA results are also shown.

	Task 1 (28 changes)	Task 2 (Part Search)	Task 3 (Mod. Search)
Manual System	1200	120	30
ILP ACMS	23	3	3

(Time in minutes)

Mean Square Row (MSR) = 289960.165

Mean Square Error (MSE) = 212030.666

F statistic = MSR/MSE = 1.3675

F critical value (10 percent error) = 4.54

Figure 4-2. ANOVA Results With Single Part/Modification Search

The times for the computer system met the pre-specified criteria of at least a twenty-five percent reduction in time. The ANOVA results were not, however, significant at the ten percent level of risk. The F statistic for row differences, 1.3675, was less than the critical F value for the ten percent risk level, 4.54 (4:847).

When the number of parts and modifications to be researched was increased to ten, the results became significant. This was because of the linear nature of the time and task relationship of the manual system. For instance, it took 120 minutes to search a single part number with the manual system. It took 1200 minutes (or ten times 120) to search for ten parts. This same relationship was true with modifications. Searching for ten parts and modifications at once was a very realistic set of tasks for the TCG (16).

The average time to access either the PARTSRCH or MODSRCH program (or get it "on line") was two minutes. Once these programs were accessed, this two-minute period was no longer a factor if subsequent parts or modifications were searched. Using an Anderson-Jacobson AF832 high-speed printer, the time to print output for ten parts or modifications was eleven minutes for each task. The two minutes required to get each program "on line" resulted

in total times for each task of thirteen minutes. The time comparisons and ANOVA results using ten parts and modifications are shown in Figure 4-3.

	Task 1 (28 changes)	Task 2 (Part Search (10 parts)	Task 3 (Mod. Search) (10 mods.)
Manual System	1200	120	30
ILP ACMS	25	13	13

(Time in minutes)

MSR = 1169533.5

MSE = 135024.0

F statistic = MSR/MSE = 8.67

Critical F value (10 percent error) = 4.54

Critical F value (5 percent error) = 7.71

Figure 4-3. ANOVA Results With Multiple Searches, High-Speed Printer

This result was statistically significant at the five percent level of error. The speed of the printer appeared an important factor. When the same multiple searches for parts and modifications were accomplished using the tele-typewriter, Model 35, (the slower speed printer available to the TCG) the times were as shown in Figure 4-4.

	Task 1 (28 changes)	Task 2 (Part Search) (10 parts)	Task 3 (Mod. Search) (10 mods.)
Manual System	1200	1200	300
ILP ACMS	25	20	20

(Time in minutes)

MSR = 1157204.16

MSE = 135004.17

F statistic = MSR/MSE = 8.57

Critical F value (10 percent error) = 4.54

Critical F value (5 percent error) = 7.71

Figure 4-4. ANOVA Results With Multiple Searches, Slow-Speed Printer

Even with the slower speed printer, the results were again statistically significant at the five percent level of risk.

Comparing the times for the manual system and the ILP ACMS for Task 1, 28 changes to a file listing; Task 2, searching a single part; and Task 3, searching a single modification, the criteria test of a twenty-five percent reduction for each task was met. The differences in times were not, however, statistically significant at the ten percent risk level. However, when Tasks 2 and 3 were expanded to search ten parts and modifications along

with Task 1, 28 changes, the results were statistically significant not only at the ten percent risk level, but also at the five percent risk level, regardless of whether a high or low speed printer was used. Based on these results, several conclusions and recommendations were arrived at and are presented in Chapter V.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The ILP ACMS is capable of performing representative TCG configuration accounting tasks more rapidly than with the present manual system. This is evidenced by the meeting of the criteria test of a twenty-five percent reduction in time and the statistically significant time differences, at the five percent risk level, demonstrated for multiple part and modification searches. TCG personnel have witnessed operation of the ILP ACMS and have confirmed its capability of outputting information the TCG requires (16). In addition to performing TCG configuration accounting tasks more rapidly and as desired by the TCG, the ILP ACMS also has the advantage of providing reports at any time. The USAF ACMS reports are only available quarterly. In this respect, the ILP ACMS allows the TCG to be more responsive and flexible in performing its functions.

The ILP ACMS demonstrated it could be expanded to include a large number of parts and modifications. Once an early prototype of the ILP ACMS was capable of processing a small number (10) of parts and modifications, the files were expanded (approximately 500 parts and 200 modifications).

The computer programs which make up the ILP ACMS were written with access capability. To implement the ILP ACMS, the TCG need only obtain user identification, password, and a job identification number to utilize the Air Force Logistics Command CREATE computer system. At the TCG's request, the most current data was not utilized in building part and modification files, since the most current listing is not yet available. Instructions for building data files may be found in Appendix C. Use of these programs once the desired information is put into the data files is freely available to the TCG and has been shown to be capable of saving valuable time.

Based on the findings in this research several areas merit further consideration in the future. These areas might include the following:

1. As the TCG further expands the scope of the ILP ACMS a standardized coding system for parts and non-U.S. modifications would be desireable. Presently, both an item number and a computer code are used to identify parts within the Government Furnished Equipment List and the detailed specifications. Neither item number nor computer code was developed by the TCG and as a result they do not meet their needs.

2. The responsiveness and flexibility of the ILP ACMS need not be limited to meeting just the needs of the F-4

TCG. The ILP ACMS is capable of meeting other currently operating TCGs' needs. Additionally, as more weapon systems are used abroad and as some weapon systems are co-produced by the U. S. and its allies, the ILP ACMS might be considered in meeting their weapons systems configuration accounting requirements.

3. Further research efforts directly related to the ILP ACMS might consider removal of all F-4 ILP data and reports from the USAF ACMS and incorporated into the ILP ACMS. One benefit of such an effort would be the availability of reports at any time. As identified earlier, USAF ACMS reports are only available quarterly. Another benefit of consolidating all ILP data would obviously be the increase in efficiency and effectiveness of TCG operations.

APPENDIX A

GLOSSARY OF TERMS

APPENDIX A

GLOSSARY OF TERMS

Advanced Configuration Management System (ACMS)

A computerized program to account for Time Compliance Technical Orders (TCTOs) issued against the aerospace vehicle, engine, components, spares, and associated support equipment by part number and serial number (10:Atch.1).

Baseline

A set of configuration identification documents, the complete technical description formally designated and fixed at a specific point in time during the life cycle. The initial approved configuration program for operational use (7:62).

International Logistics Program (ILP)

The furnishing of materials or services to a foreign country under the provisions of one or more of the following programs: (1) Foreign Military Sales, and (2) Grant Aid (7:228). The foreign countries that have purchased F-4 aircraft from the United States are: Spain, West Germany, Greece, Turkey, Japan, Iran, Israel, Korea, and the United Kingdom. Presently, the ILP countries that use the services of the TCG are: Spain, West Germany,

Greece, Iran, Israel, Turkey, and Korea (10:Atch.2; 13). Japan and the United Kingdom have expressed an interest in joining the TCG (13). This research only addresses those ILP countries that are currently members of the TCG.

Technical Coordination Group (TCG)

An organization established to assist both the USAF and Security Assistance Countries in improving the maintainability, reliability, and overall performance of their aircraft by making possible the joint use of USAF and country technical and engineering data and joint action to correct deficiencies. This report concerns the F-4 TCG (10:2).

Time Compliance Technical Order (TCTO)

An action requirement specified by a Technical Order which sets completion of required action within a stated time period. A TCTO sets forth instructions for modifying equipment, performing or initially establishing special inspections, or imposing temporary flight restrictions (7:455).

APPENDIX B

FLOW CHARTS AND PROGRAMS

APPENDIX B

FLOW CHARTS AND PROGRAMS

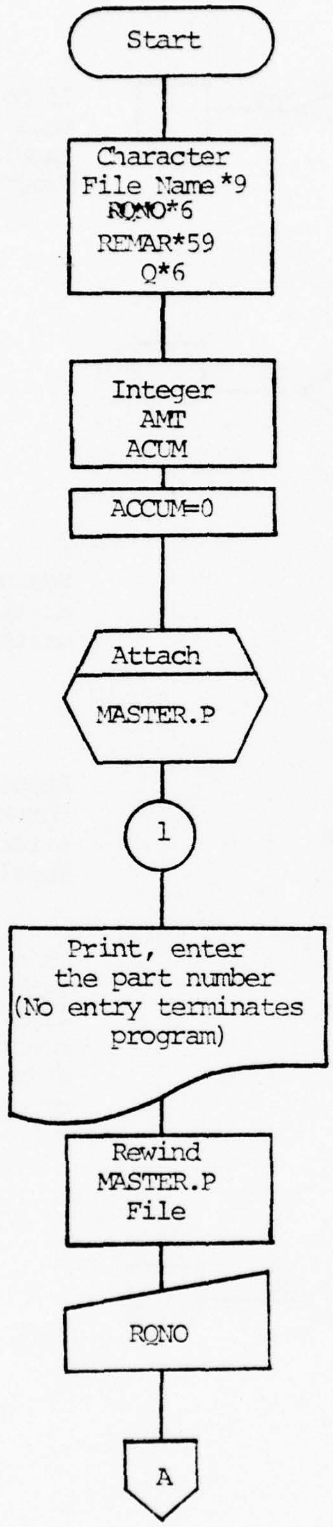
This appendix contains information relating to the programs PARTSRCH and MODSRCH. A table of symbols used, a program flow chart, and the actual program are supplied for each program. PARTSRCH is presented first, then MODSRCH.

PARTSRCH SYMBOL DESCRIPTION

These variable symbols were used in the PARTSRCH program and are explained here.

Variable Name	Meaning
File Name	The eight character name given to the file identifying a country/model group.
RQNO	The code of the part for which the search is made.
REMAR	Refers to the remarks section (fifty-nine characters) in the country/model file.
LNO	The line number of the entry in any file.
Q	The part codes listed in the country/model file (against which RQNO is to be compared).
AMT	The number of a country's model of F-4s listed on the master file.
ACUM	A counter used to compute the grand total of a particular part number.
MASTER.P	The name of the master file.

PARTSRCH Flow Chart



Specify lengths for alpha numeric strings.

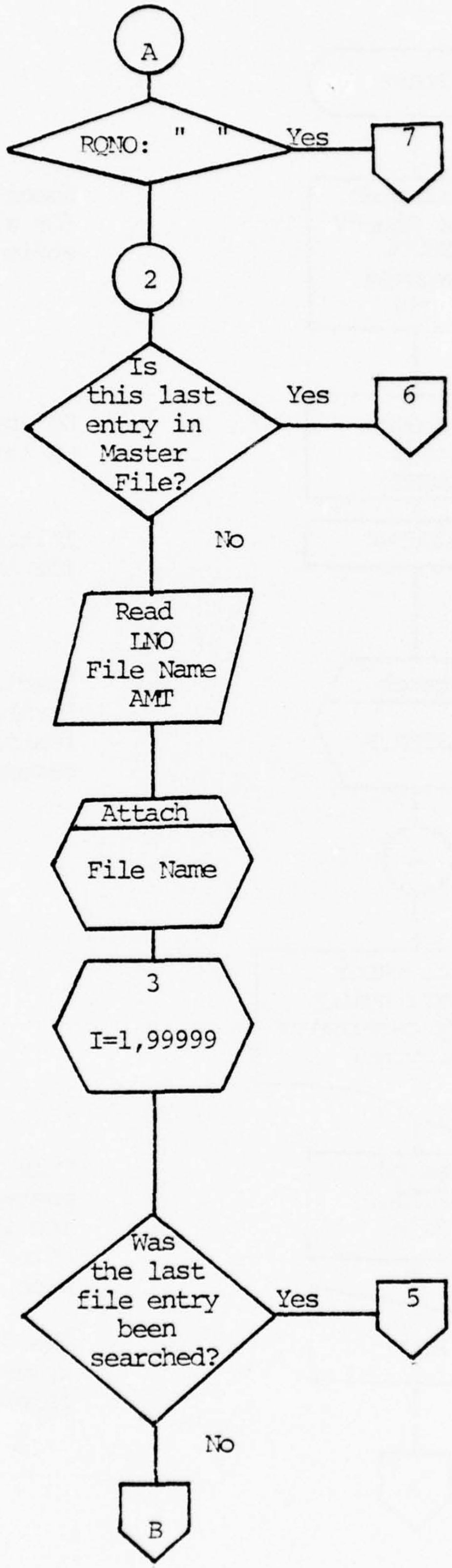
Defines AMT, ACUM as integer values.

Initialize value for ACUM.

Special Honeywell/ Fortran call feature attaches master file.

This insures the master file entries are in proper order after previous uses.

The desired part is types into the remote terminal.

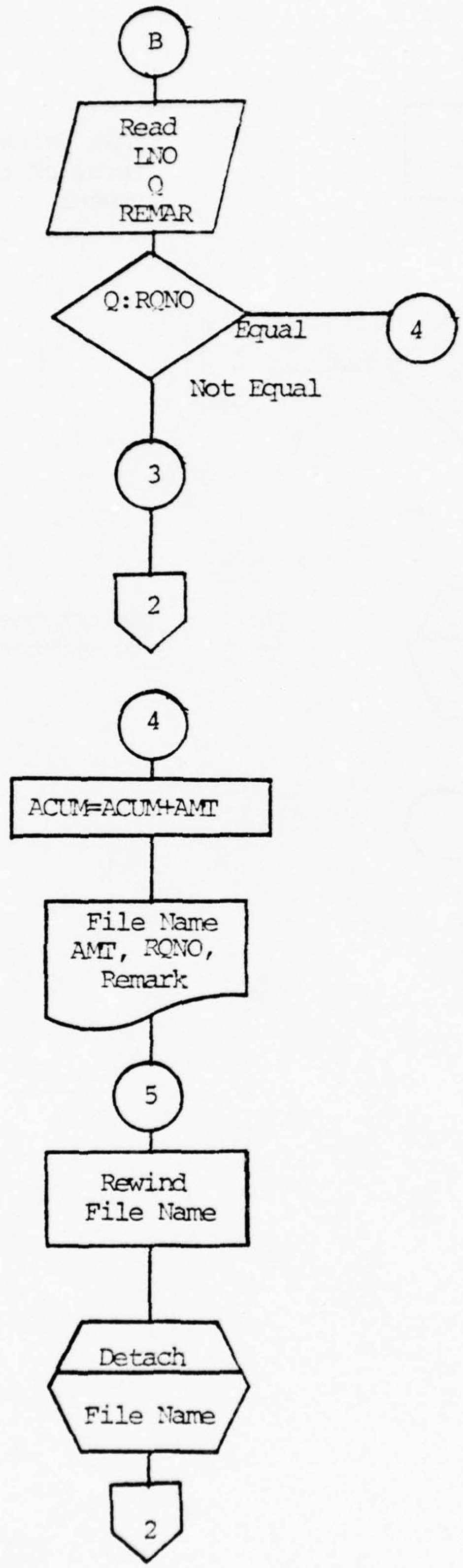


If no entry is made (by pressing carriage return key) program is terminated.

Reads one entry at at time from the master file.

Special Honeywell/Fortran call feature attaches a country/model file.

This is a nested loop that allows 99,999 line entries in a country/model file. This could be increased or decreased.

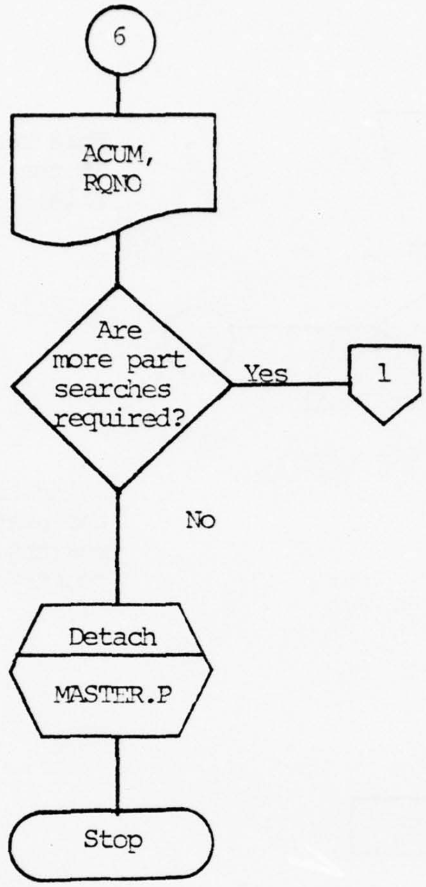


This reads in entry in the country/model file.

Going to 4 or 5 breaks the nested loop that searches through the country/model file.

This prints count and remarks information for the country/model.

These features prepare the file for later searches and return it to storage.



This prints the grand total of the part number.

Return the master file to storage.

```
      CHARACTER FILENAME*9,RQNO*6,REMAR*59,Q*6
      INTEGER AMT,ACUM
C*********************************************
C*         ATTACH MASTER FILE                *
C*********************************************
      CALL ATTACH(24,"77A87/MASTER.P;",1,0,ISTAT,)
C*********************************************
C*          INPUT THE INITIAL REQUESTS       *
C*********************************************
    1 PRINT,"ENTER THE PART NUMBER (NO ENTRY TERMINATES PROGRAM)"
      REWIND 24
      ACUM = 0
      READ,RQNO
      IF(RQNO.EQ." ")GO TO 7
C*********************************************
C*      TERMINATION WHEN NO FURTHER REQUEST MADE *
C*********************************************
    2 CONTINUE
      READ(24,7003,END=6)LNO,FILENAME,AMT
C*********************************************
C*    ATTACH EACH COUNTRY/MODEL FILE IN ORDER    *
C*    IDENTIFIED ON MASTER FILE                  *
C*********************************************
      CALL ATTACH(25,FILENAME,1,0,ISTAT,)
      DO 3 I = 1,99999
 READ(25,7002,END=5)LNO,Q,REMAR
      IF(Q.EQ.RQNO)GO TO 4
    3 CONTINUE
      GO TO 2
C*********************************************
C*      IF PART IS FOUND, COUNT THE TOTAL FROM   *
C*      THE MASTER FILE. PRINT TOTAL & REMARKS   *
C*********************************************
    4 ACUM = ACUM + AMT
 PRINT 7001,FILENAME,AMT,RQNO,REMAR
C*********************************************
C*      WHEN PART IS FOUND, RETURN FILE TO       *
C*      STORAGE. GO TO NEXT COUNTRY/MODEL FILE   *
C*********************************************
      REWIND 25
      CALL DETACH(25,,)
      GO TO 2
C*********************************************
C*      IF PART IS NOT FOUND BY END OF FILE      *
C*      RETURN FILE TO STORAGE. GO TO NEXT       *
C*      COUNTRY/MODEL FILE                       *
C*********************************************
```

```
    5  REWIND 25
       CALL DETACH(25,,)
       GO TO 2
    6  PRINT 7004,ACUM,RQNO
       GO TO 1
    7  PRINT," "
       PRINT," "
C************************************************
C*        PUT THE MASTER FILE BACK IN STORAGE        *
C************************************************
       CALL DETACH(24,,)
       STOP
C************************************************
C*        FORMAT STATEMENTS USED FOR PRINTING        *
C************************************************
 7001 FORMAT(1X,A8,1X,"HAS ",I5," OF PART NUMBER ",A6,".",/,
&1X,"REMARKS - ",A60,".",//)
 7002 FORMAT(I5,1X,A6,1X,A59)
 7003 FORMAT(V)
 7004 FORMAT (1X,"THERE ARE ",I5," OF REQUESTED PART NO.",
&A6,".",////)
       END
```

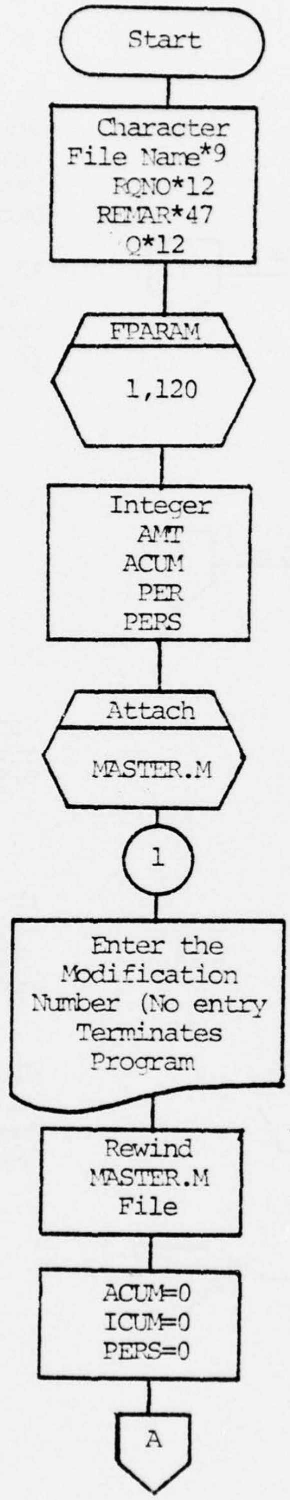
MODSRCH SYMBOL DESCRIPTION

These variable symbols were used in the MODSRCH program and are explained here.

Variable Name	Meaning
File Name	The eight character name given to the file identifying a country/ model group.
RQNO	The requested modification code for which the search is made.
REMAR	Refers to the remarks section (forty-seven characters) in the country/model file.
LNO	The line number of the entry in any file.
Q	The modification codes listed in the country/model file (against which RQNO is compared).
AMT	The number of a country's models of F-4s listed on the master file.
M	The number of modifications complete for a given country/ model group.
ACUM	A counter used to compute the grand total of modifications complete.
ICUM	A counter used to compute the grand total of F-4s in all the country/model files.

Variable Name	Meaning
PER	The percentage of modifications completed for a country/model group (PER = $\frac{M}{AMT}$ x 100).
PERS	The percentage of <u>all</u> the ILP F-4 force having a certain modification complete (PERS = $\frac{ACUM}{ICUM}$ x 100).

MODSRCH Flow Chart

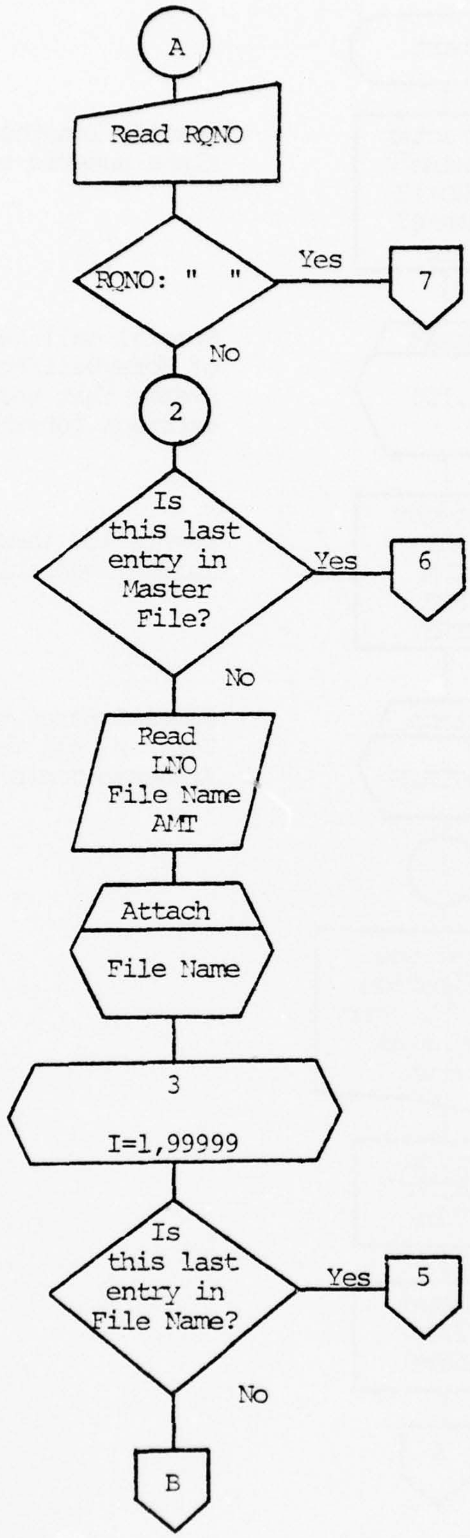


Specify lengths for alpha numeric strings.

Special call feature of Honeywell/Fortran System that redefines carriage length.

Identifies these as integer variables.

Special Honeywell/Fortran call features. Attaches master file.



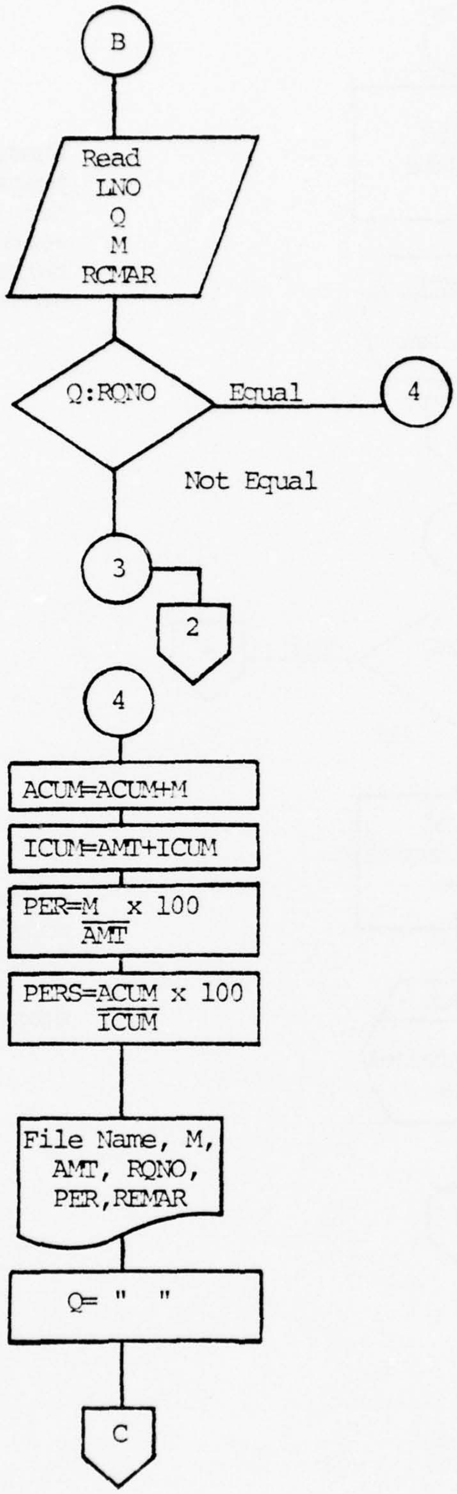
Desired modification code is typed into the remove terminal.

If no entry is made (by pressing carriage return key) program is terminated.

Reads one entry at a time from the Master File.

Special Honeywell/ Fortran call feature attaches a country/ model file.

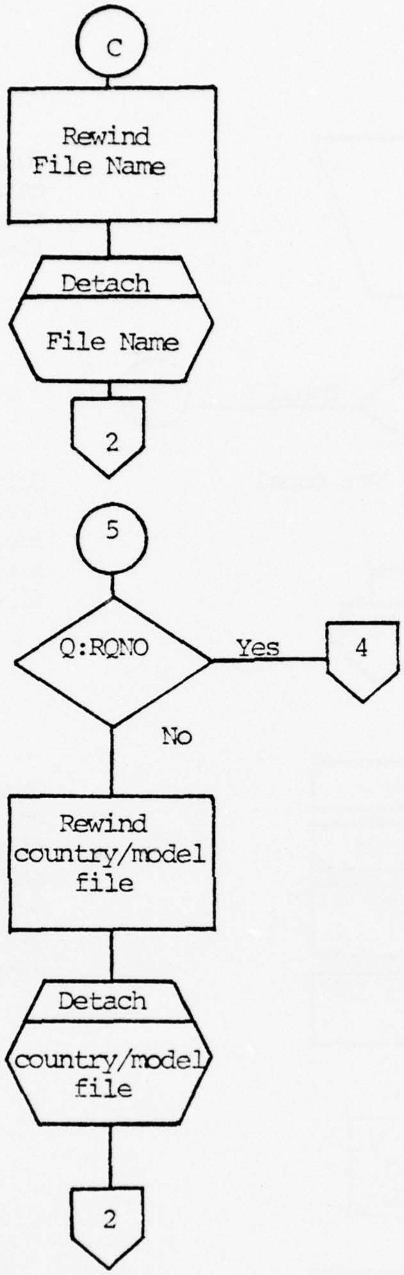
This is a nested loop allowing 99,999 line entries. This can be increased or decreased.



This reads an entry in the country/model file.

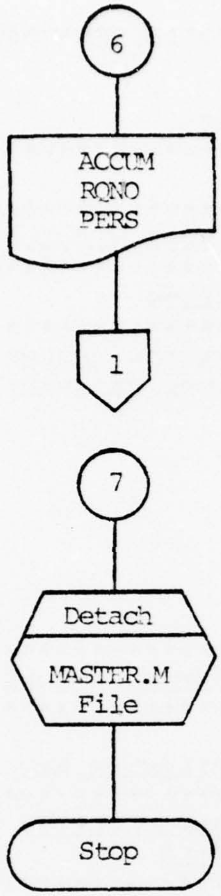
Going to 4 or 5 breaks the nested loop that searches a country/model file.

This process notes the number of modifications completed and computes a percentage which is printed in the next step.



These processes prepare the file for further searches then return it to storage.

These features prepare the country/ model file for further searches and return it to storage.



This prints the grand total of modifications completed and the percentage.

This step allows further modification searches before the program is terminated.

This special Honeywell/Fortran feature returns the Master File to storage and terminates the program.

```
      CHARACTER FILENAME*9,RQNO*12,REMAR*47
      CALL FPARAM(1,120)
      CHARACTER Q*12
      INTEGER AMT,ACUM,PER,PERS
C*************************************************
C*      ATTACH MASTER.M FILE                     *
C*************************************************
      CALL ATTACH(24,"77A87/MASTER.M;",1,0,ISTAT,)
C*************************************************
C*      INPUT THE INITIAL REQUESTS               *
C*************************************************
    1 PRINT,"ENTER THE MODIFICATION NUMBER"
      PRINT,"(NO ENTRY TERMINATES PROGRAM)"
      REWIND 24
      ACUM = 0
      ICUM = 0
      PERS = 0
      READ,RQNO
      PRINT," "
      PRINT," "
      IF(RQNO.EQ." ")GO TO 7
C*************************************************
C*      TERMINATION WHEN NO FURTHER REQUESTS MADE*
C*************************************************
    2 CONTINUE
      READ(24,7003,END=6)LNO,FILENAME,AMT
C*************************************************
C*      ATTACH EACH COUNTRY/MODEL FILE IN ORDER  *
C*      IDENTIFIED ON MASTER FILE                *
C*************************************************
      CALL ATTACH(25,FILENAME,1,0,ISTAT,)
      DO 3 I = 1,99999
           READ(25,7002,END=5)LNO,Q,M,REMAR
       IF(Q.EQ.RQNO)GO TO 4
    3 CONTINUE
      GO TO 2
C*************************************************
C*      IF MODIFICATION IS FOUND, COUNT THE TOTAL*
C*      FROM THE MASTER FILE, PRINT IT, COMPUTE  *
C*      AND PRINT PERCENTAGE, AND PRINT REMARKS  *
C*************************************************
    4 ACUM = ACUM + M
      ICUM =AMT + ICUM
      PER = M*100/AMT
      PERS = ACUM*100/ICUM
          PRINT 7001,FILENAME,M,AMT,RQNO,PER,REMAR
      Q = " "
C*************************************************
```

```
C*       WHEN MODIFICATION IS FOUND, PUT THE COUNTRY*
C*       /MODEL FILE BACK IN STORAGE AND GO TO THE  *
C*       NEXT ONE                                   *
C***************************************************
      REWIND 25
      CALL DETACH(25,,)
      GO TO 2
C***************************************************
C*       IF MODIFICATION IS NOT FOUND AT END OF     *
C*       FILE PRINT NOTHING, RETURN FILE TO STORAGE *
C*       AND GO TO NEXT COUNTRY/MODEL FILE          *
C***************************************************
    5 IF(Q.EQ.RQNO)GO TO 4
      REWIND 25
      CALL DETACH(25,,)
      GO TO 2
    6 PRINT 7004,ACUM,RQNO,PERS
      GO TO 1
    7 PRINT," "
      PRINT," "
C***************************************************
C*       PUT THE MASTER FILE BACK IN STORAGE        *
C***************************************************
      CALL DETACH(24,,)
      STOP
C***************************************************
C*       FORMAT STATEMENTS USED FOR PRINTING        *
C***************************************************
 7001 FORMAT(1X,A8,1X," HAS ",I5," OF ",I5," MOD. ",A12,
     &" DONE FOR ",I5," %"/1X,"REMARKS - ",A47//)
 7002 FORMAT(I5,1X,A12,1X,I5,1X,A47)
 7003 FORMAT(V)
 7004 FORMAT(1X,"THERE ARE ",I5," OF MODIFICATION NUMBER ",A12,
     &/,"COMPLETED AND TOTAL PERCENTAGE IS ",I5,"%.",////)
     END
```

APPENDIX C

INSTRUCTIONS FOR USE OF THE COMPUTER MODEL

APPENDIX C

INSTRUCTIONS FOR USE OF THE COMPUTER MODEL

This appendix contains the instructions (step-by-step examples) for interacting with the two programs, PARTSRCH and MODSRCH, and the various files which make up the computer model. These instructions assume the terminal operator has a basic knowledge of gaining access to, or logging on, the CREATE system. If the terminal operator does not have this knowledge and/or requires further instructions, guidance is provided in Chapter 3 of Grad Log FORTRAN Y User's Guide by Mr. Daniel E. Reynolds, School of Systems and Logistics, Wright-Patterson AFB, Ohio, June 1976. A copy has been furnished to the TCG. Within this appendix, instructions for submitting information to terminal operators on FORTRAN coding forms (such as AFIT Form 0-4, May 1972) are also given.

APPENDIX C - INDEX

INSTRUCTIONS FOR USE OF PARTSRCH AND MODSRCH

1. Researching a Part Number

To research a specific part number the following steps are required by the terminal operator. The first portion of each step identifies the computer response and is followed

by an explanation and the required operator response, which is underlined. The return key should be depressed after each operator response. Part number 101 is used as an example.

Step 1: SYSTEM? Identify the computer language to be used. This will always be FORTRAN and can be abbreviated FORT.

Step 2: OLD OR NEW. Identify the program to be used. Since you are searching for a part number and the program already exists, your response is OLD PARTSRCH.

Step 3: READY. The command RUN compiles and executes
*
your desired program.

Step 4: Enter the part number (no entry terminates the program).
=

The desired part number to be searched should be entered after the = sign. Your response for part 101 is =101.

Step 5: At this step the terminal will print the desired output.

Step 6: Enter the part number (no entry terminates the program).
=

This computer response will be repeated after each requested part is searched. If another part search is desired return to Step 4. If

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A METHOD FOR AUGMENTING THE ADVANCED CONFIGURATION MANAGEMENT S--ETC(U)
JUN 77 G F BOSWELL, T E DISTELHORST
UNCLASSIFIED AFIT-LSSR-23-77A NL

2 OF 2
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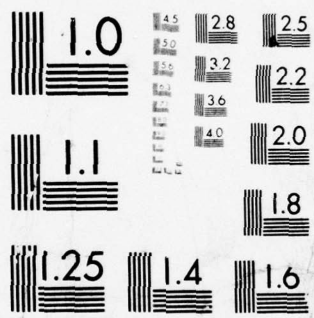

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

not, depress the return key. This action terminates the PARTSRCH program.

Step 7: *. To sign off the computer the BYE command should be used.

An example of the above seven steps as they occur on a terminal is as follows:

```
Step 1:  SYSTEM?  FORT

Step 2:  OLD OR NEW-OLD PARTSRCH

Step 3:  READY
         *RUN

Step 4:  ENTER THE PART NUMBER (NO ENTRY TERMINATES
         PROGRAM).
         =101

Step 5:  PISRF4E. HAS 134 OF PART NUMBER 101.
         REMARKS - J79-GE-17B ENGINE (LOW SMOKE).

         PISRRF4E HAS 10 OF PART NUMBER 101.
         REMARKS - J79-GE-17B ENGINE (LOW SMOKE).

         PGREF4E. HAS 37 OF PART NUMBER 101.
         REMARKS - J79-GE-17A ENGINE.

         PTURF4E. HAS 41 OF PART NUMBER 101.
         REMARKS - J79-GE-17A ENGINE.

         THERE ARE 322 OF REQUESTED PART NO. 101.

Step 6:  ENTER THE PART NUMBER (NO ENTRY TERMINATES
         PROGRAM).
         =

Step 7:  *BYE

CREATE off at 19.267
```

To submit this information via FORTRAN coding forms, simply list the part numbers to be researched, along with the program name PARTSRCH to the terminal operator, who should reference the above steps.

2. Listing All Parts for a Given Country/Model

To list all parts for a given country/model, the following steps are required by the terminal operator. The first portion of each step identifies the computer response and is followed by an explanation and the required operator response, which is underlined. The return key should be depressed after each operator response. Part file PISRF4E. (Israel's F-4Es) is used as an example.

NOTE: The file names developed for the country and model are left to the discretion of the user. The following names were used by the researchers in developing the computer model:

PISRF4E. for Israel's F-4Es

PISRRF4E for Israel's RF-4Es

PGREF4E. for Greece's F-4Es

PTURF4E. for Turkey's F-4Es

Due to the nature of the program language, all eight spaces must be filled in the file names. Periods were used as fillers.

Step 1: SYSTEM? Identify the computer language to be used. This will always be FORTRAN and can be abbreviated FORT.

Step 2: OLD OR NEW. Identify the program file to be listed. Since the file already exists, your response is OLD PISRF4E..

Step 3: READY. The command LIST executes your
*
desired Program.

Step 4: At this step the terminal will print the desired output.

NOTE: If further lists of other part files are desired, any time an asterisk appears, type LIST, skip a space and type the file name. (Example: *LIST PGREF4E.)

Step 5: *. To sign off the computer, the BYE command should be used.

An example of the above steps as they occur on a terminal is as follows:

```
Step 1:  SYSTEM?  FORT

Step 2:  OLD OR NEW-OLD PISRF4E.

Step 3:  READY
         *LIST

Step 4:  00010  101      J79-GE-17B ENGINE (LOW SMOKE)
         00020  201
         00030  201-01
         00040  201-02
         00050  202
```

Step 4: (Continued)

00060	203
00070	204
00080	205
00090	206
00100	207

Step 5: *BYE

CREATE off at 9.305

To submit this information via FORTRAN coding forms, simply list the file names to be listed by the operator.

3. Researching a Modification Number

To research a specific modification number the following steps are required by the terminal operator. The first portion of each step identifies the computer response and is followed by an explanation and the required operator response, which is underlined. The return key should be depressed after each operator response. Modification number 1F-4E-1313 is used as an example.

Step 1: SYSTEM? Identify the computer language to be used. This will always be FORTRAN and can be abbreviated FORT.

Step 2: OLD OR NEW. Identify the program to be used. Since you are searching a modification number and the program already exists, your response is OLD MODSRCH.

Step 3: READY. The command RUN compiles and
*
executes your desired program.

Step 4: Enter the modification number (no entry terminates the program).
=

The desired modification number to be searched should be entered after the = sign. Your response for modification 1F-4E-1313 is =1F-4E-1313.

Step 5: At this step the terminal will print the desired output.

Step 6: Enter the modification number (no entry terminates the program).
=

This computer response will be repeated after each requested modification is searched. If another modification search is desired, return to Step 4. If not, depress the return key. This action terminates the MODSRCH program.

Step 7: *. To sign off the computer the BYE command should be used.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

Step 2: OLD OR NEW-OLD MODSRCH

```
Step 3:  READY
         *RUN

Step 4:  ENTER THE MODIFICATION NUMBER (NO ENTRY
         TERMINATES THE PROGRAM)
         =1F-4E-1313

Step 5:  MISRF4E. HAS 23 OF 134 MOD 1F-4E-1313 DONE FOR 17%
         REMARKS - MOD TO EJECTION SEAT

         MISRRF4E HAS 6 OF 10 MOD. 1F-4E-1313 DONE FOR 60%
         REMARKS - EJECTION SEAT MOD, BOUGHT 4/5/74

         MGREF4E. HAS 30 OF 37 MOD. 1F-4E-1313 DONE FOR 81%
         REMARKS - MOD TO EJECTION SEAT, BOUGHT 4/4/74

         MTURF4E. HAS 20 OF 40 MOD. 1F-4E-1313 DONE FOR 50%
         REMARKS - EJECTION SEAT MOD, BOUGHT 6/5/74

         THERE ARE 79 OF MODIFICATION NUMBER 1F-4E-1313
         COMPLETED AND TOTAL PERCENTAGE IS 35%.

Step 6:  ENTER THE MODIFICATION NUMBER
         (NO ENTRY TERMINATES THE PROGRAM)
         =

Step 7:  *BYE

CREATE off at 9.909
```

To submit this information via FORTRAN coding forms, simply list the modification numbers to be searched, along with the program name MODSRCH to the terminal operator, who should reference the above steps.

4. <u>Listing All Modifications for a Given Country/Model</u>

To list all modifications for a given country/model, the following steps are required by the terminal operator. The first portion of each step identifies the computer response and is followed by an explanation and the required

operator response, which is underlined. The return key should be depressed after each operator response. Modification file MTURF4E. (Turkey's F-4Es) is used as an example.

NOTE: The file names developed for the country and model are left to the discretion of the user. The following names were used by the researchers in developing the computer model:

MISRF4E. for Israel's F-4Es
MISRRF4E for Israel's RF-4Es
MGREF4E. for Greece's F-4Es
MTURF4E. for Turkey's F-4Es

Due to the nature of the program language, all eight spaces must be filled in the file name. Periods were used as fillers.

Step 1: SYSTEM? Identify the computer language to be used. This will always be FORTRAN and can be abbreviated <u>FORT</u>.

Step 2: OLD OR NEW. Identify the program file to be listed. Since the file already exists, your response is <u>OLD MTURF4E.</u>.

Step 3: READY. The command <u>LIST</u> executes your * desired program.

Step 4: At this step the terminal will print the desired output.

NOTE: If further lists of other modification files are desired, any time an asterisk appears, type <u>LIST</u>, skip a space and type the file name (Example: *LIST MGREF4E.)

Step 5: *. To sign off the computer, the <u>BYE</u> command should be used.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

Step 2: OLD OR NEW-OLD MTURF4E.

Step 3: READY
*LIST

Step 4:
```
00010 1F-4E-1313 00020 EJECTION SEAT MOD, BOUGHT 6/5/74
00020 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00030 1F-4E-517  00016 CANOPY SEAL MOD
00040 1F-4E-2001 00000 REJECTION LETTER DATED 7 JUN 74
```

READY

Step 5: *BYE

To submit this information via FORTRAN coding forms, simply list the file names to be listed by the operator.

5. <u>Changing the Part and/or Modification List for a Particular Country/Model</u>

A variety of methods for changing lists may be used, depending on the user's preferences. Some basic options are shown here. Three separate cases are used to illustrate these options.

CASE 1: New Parts/Modifications are Obtained Replacing Previous Parts/Modifications

To replace a previous part/modification with a new one the following steps are required by the terminal operator. Required responses to computer queries are underlined. Modification file MTURF4E. is used as an example and line number 00030 of that file is to be changed.

Step 1: If desired, list the appropriate file as in paragraphs 2 and 4. Otherwise, continue with Step 2.

NOTE: Further information for listing portions of a file, as well as other time-sharing commands, is shown on pages 5-22 to 5-32 of Grad Log FORTRAN Y User's Guide.

Step 2: *. Type in the desired new line to replace the old line, and follow the appropriate format for part files or modification files as shown here:

Part File Format (See Figure C-1):

Five digit line number, one blank space, six character part code, one blank space, fifty-nine character remarks section.

Modification File Format (See Figure C-1):

Five digit line number, one blank space, twelve character modification code, one blank space, five digit number of completed modifications, one blank space, forty-seven character remarks section.

NOTE: IT IS VERY IMPORTANT TO ADHERE TO THESE FORMATS. ALSO, THE FIVE DIGIT SPACE FOR COMPLETED MODIFICATIONS MUST BE COMPLETELY FILLED, AND THE NUMBER RIGHT JUSTIFIED (i.e., 23 BECOMES 00023). FAILURE TO COMPLY WILL RESULT IN ERRONEOUS OUTPUT.

Step 3: *. Resave the file under the same file name. Your response should be *RESA MTURF4E..

Step 4: If you desire to re-list the file or portions of it to check for correctness, refer to the NOTE following Step 1 of paragraph 5 again. If not, proceed to Step 5.

Step 5: *. The sign off command BYE is used to sign off the computer.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

OLD OR NEW-OLD MTURF4E.

READY
*LIST

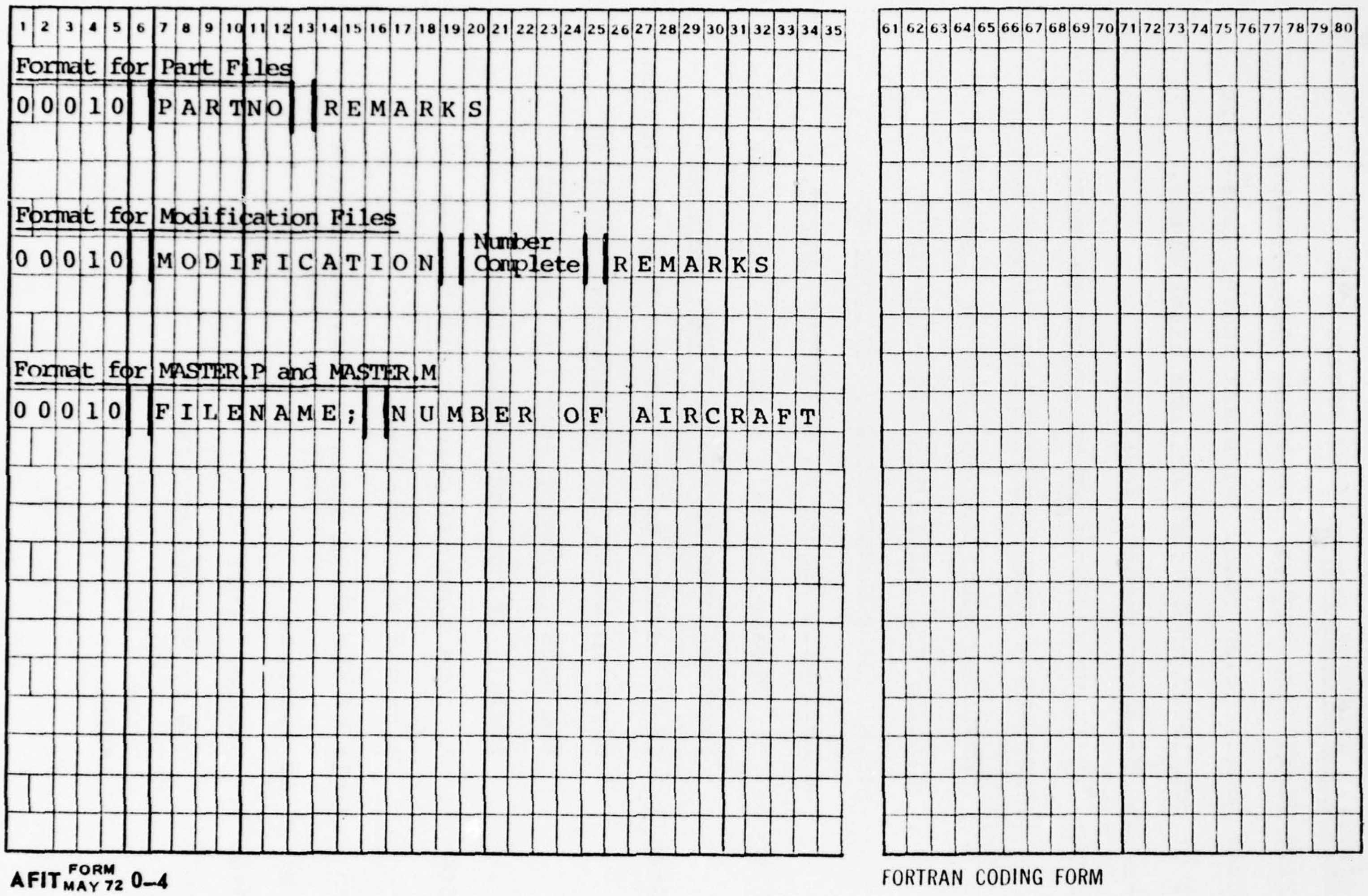

Figure C-1. FORTRAN Coding Form

```
00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00020 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00030 1F-4E-517  00016 CANOPY SEAL MOD
00040 1F-4E-2001 00000 REJECTION LETTER DATED 7 JUN 74
```

READY

Step 2: *00030 1F-4E-517 00012 AUTO-PILOT MOD, BOUGHT 7/4/76

Step 3: *RESA MTURF4E.
DATA SAVED-MTURF4E.

Step 4: READY
*LIST

```
00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00020 1F-4E-1314 00015 NOSE GEAR MOD,BOUGHT 7/7/74
00030 1F-4E-517  00012 AUTO-PILOT MOD, BOUGHT 7/4/76
00040 1F-4E-2001 00000 REJECTION LETTER DATED 7 JUN 74
```

Step 5: READY
*BYE

CREATE off at 12.707

To accomplish via FORTRAN coding forms, code the new information in accordance with the proper format specified above. See Figure C-1 for an example.

CASE 2: Adding New Parts/Modifications to a List

To add new parts/modifications to a list, the following steps are required by the terminal operator. Required responses to computer queries are underlined. Modification file MTURF4E. is used as an example and modification 1F-4E-1315 is to be added to the file.

Step 1: If desired, list the appropriate file as in paragraphs 2 and 4. Otherwise, continue with Step 2.

NOTE: See previous NOTE under CASE 1, Step 1.

Step 2: Type in new line number (choice of a number between two other numbers will place the new line in its desired sequence) in accordance with formats following CASE 1, Step 2, and shown in Figure C-1.

Step 3: If desired, re-sequencing of line numbers (by fives, tens, etc.) may be accomplished in the following manner:

*RESA 00010,5 (This will number the line numbers 00010, 00015, 00020, etc.)

Step 4: *. Resave the file under the same file name. Your response should be *RESA MTURF4E..

Step 5: If you desire to re-list the file or a portion of it to check for correctness, refer to the NOTE following Step 1 of paragraph 5 again. If not, proceed to Step 6.

Step 6: The sign off command BYE is used to sign off the computer.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

OLD OR NEW-OLD MTURF4E.

READY
*LIST

```
00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00020 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00030 1F-4E-517  00016 CANOPY SEAL MOD
00040 1F-4E-2001 00000 REJECTION LETTER DATED 7 JUN 74

READY
```

Step 2: *00025 1F-4E-1315 00012 UHF RADIO MOD, BOUGHT 6/5/76

Step 3: *RESE 00010,5

Step 4: *RESA MTURF4E.
DATA SAVED-MTURF4E.

Step 5: *LIST

```
00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00015 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00020 1F-4E-1315 00012 UHF RADIO MOD, BOUGHT 6/5/76
00025 1F-4E-517  00016 CANOPY SEAL MOD
00030 1F-4E-2001 00000 REJECTION LETTER DATED 7 JUN 74

READY
```

Step 6: *BYE

CREATE off at 12.460

To accomplish via FORTRAN coding forms, code the new information in accordance with the proper format. See Figure C-1 for an example.

CASE 3: Deleting a Part/Modification

To delete a part/modification from a file, the following steps are required by the terminal operator. Required responses to computer queries are underlined. Modification file MTURF4E. is used as an example and modification 1F-4E-517 (line 00030) is to be deleted from the file.

Step 1: If desired, list the appropriate file as in paragraphs 2 and 4. Otherwise, continue with Step 2.

NOTE: See previous NOTE under CASE 1, Step 1.

Step 2: *. The command to delete a line number is DELE followed by a space and the line number. Your response should be *DELE 00030.

Step 3: *. If desired, re-sequencing of line numbers (by fives, tens, etc.) may be accomplished in the following manner: *RESE 00010,5. This will number the line numbers 00010, 00015, 00020, etc.

Step 4: *. Resave the file under the same file name. Your response should be *RESA MTURF4E..

Step 5: If you desire to re-list the file or a portion of it to check for correctness, refer to the NOTE following Step 1 of paragraph 5 again. If not, proceed to Step 6.

Step 6: The sign off command BYE is used to sign off the computer.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

OLD OR NEW-OLD MTURF4E.

READY
*LIST

```
00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00020 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00030 1F-4E-517  00016 CANOPY SEAL MOD
00040 1F-4E-2001 00010 REJECTION LETTER DATED 7 JUN 74

READY

Step 2:  *DELE 00030

Step 3:  *RESE 00010,5

Step 4:  *RESA MTURF4E.
         DATA SAVED-MTURF4E.

Step 5:  *LIST

00010 1F-4E-1313 00020 EJECTION SEAT MOD,BOUGHT 6/5/74
00015 1F-4E-1314 00015 NOSE GEAR MOD, BOUGHT 7/7/74
00020 1F-4E-2001 00010 REJECTION LETTER DATED 7 JUN 74

READY

Step 6:  *BYE

CREATE off at 12.780
```

To accomplish via FORTRAN coding forms, enter the line number and/or information to be deleted on a coding form.

6. Building the Initial Parts and Modification Files

This process could be done with a time-sharing terminal but due to the length of the files and the need for proper format, a simpler method is to accomplish this on FORTRAN coding forms.

A. Give the file a name to correspond to country and model aircraft. The name may be any desired but must contain no more than eight characters. If the file name has less than eight characters, a period (.) or solidi (/) must be

used to fill each extra space. The file names must be exactly the same as those in the MASTER.P (for part files) or MASTER.M (for modification files) as described in paragraph 7.

B. <u>For Part Files</u> - Follow the proper format for parts (shown in Figure C-1). Spaces 1 through 5 are for the line number in the file. Space 6 must be blank. Spaces 7 through 12 are for the part code (and may be digits or characters). Space 13 must be blank. Spaces 14 through 72 are for remarks and any desired numbers, characters, or blank spaces may be inserted.

C. <u>For Modification Files</u> - Follow the format for modifications (shown in Figure C-1). Spaces 1 through 5 are for the line number in the file. Space 6 must be blank. Spaces 7 through 18 are for the modification code (and may be digits or characters). Space 19 must be blank. Spaces 20 through 24 are for the number of completed modifications for the model and country. THIS NUMBER MUST BE RIGHT JUSTIFIED (i.e., 23 is written as 00023) OR ERRONEOUS OUTPUT MAY OCCUR. Space 25 must be blank. Spaces 26 through 72 are for remarks (which may be any desired numbers, characters, or blank spaces).

D. If accomplished on an interactive time-sharing terminal, the file should be saved under its selected name.

Further "saving" of data must be resaved. Examples of commands are:

*SAVE PGREF4E. (for the first "save)

*RESA PGREF4E. (for subsequent "saves" of the saved file)

7. Building the MASTER.P and MASTER.M Files

These files are necessary for two reasons. MASTER.P is attached to the PARTSRCH program and MASTER.M is attached to the MODSRCH program to allow a sequential search of the country/model files listed on each of these master files. Also, the number of each model aircraft owned by each country is contained in each master file. These numbers are the ones counted when a part is found and listed as total aircraft when a modification is found.

The building of these two files can be done with a time-sharing terminal but due to the need for proper format it is best accomplished on a FORTRAN coding form first. The following instructions apply to both files:

A. Because programs PARTSRCH and MODSRCH both call attach to MASTER.P and MASTER.M, respectively, it is recommended that the names for these two files not be changed. However, if it is desired these names be changed, reference paragraph 6A, and insure that PARTSRCH and MODSRCH are changed accordingly.

B. Follow the proper format for MASTER.P and MASTER.M as shown in Figure C-1. Spaces 1 through 5 are for the line number in the file. Space 6 must be blank. Spaces 7 through 14 are for the file name. All eight spaces must be filled. Fill with periods if necessary. Space 15 must contain a semi-colon (;). Space 16 should be blank. Spaces 17 through 19 are for the number of aircraft possessed by the country/model designated by the file name.

C. Once the file has been built, the file should be saved under its selected name. Reference paragraph 6D for data saving.

8. Listing a Master File

To list a master file, the following steps are required by the terminal operator. The first portion of each step identifies the computer response and is followed by an explanation and the required operator response, which is underlined. The return key should be depressed after each operator response. MASTER.P file (master file for parts) is used as an example.

Step 1: SYSTEM? Identify the computer language to be used. This will always be FORTRAN and is abbreviated FORT.

Step 2: OLD OR NEW. Identify the file to be listed. Since the file already exists, your response is <u>OLD MASTER.P</u>.

Step 3: READY. The command <u>LIST</u> executes your
*
desired program.

Step 4: At this step the terminal will print the desired program.

Step 5: *. To sign off the computer, the <u>BYE</u> command should be used.

An example of the above steps as they occur on a terminal is as follows:

```
Step 1:  SYSTEM?  FORT

Step 2:  OLD OR NEW-OLD MASTER.P

Step 3:  READY
         *LIST

Step 4:  00010 PISRF4E.; 134
         00020 PISRRF4E;  10
         00030 PGREF4E.;  37
         00040 PTURF4E.;  41

         READY

Step 5:  *BYE

CREATE off at 11.831
```

To submit this information via FORTRAN coding form, simply list the file names to be listed by the terminal operator.

9. Changing a Master File

Master files must be changed when a new country becomes an ILP member or withdraws its membership as an ILP nation and when the number of aircraft possessed by an ILP nation changes. To change a master file, the following steps are required by the terminal operator. Three cases are presented: adding a country, changing a country's possessed aircraft total, and deleting a country.

CASE 1: Adding a Country to a Master File

To add a country to a master file, the following steps are required by the terminal operator. Required responses to computer queries are underlined. File MASTER.P is used as an example and it is assumed that Iraq (designated PIRQF4E. with fifty new purchased F-4Es) has just become an ILP member.

Step 1: If desired, list the appropriate file as in paragraph 8. Otherwise, continue with Step 2.

Step 2: Type in the desired new line number and follow the appropriate format. Reference paragraph 7B and/or Figure C-1. Your response should be *00050 PIRQF4E.; 50.

NOTE: FAILURE TO COMPLY WITH THIS FORMAT WILL RESULT IN ERRONEOUS OUTPUT.

Step 3: *. Resave the file under the same file name: *RESA MASTER.P.

Step 4: *If you desire to re-list the file to check for correctness, your response should be: *LIST.

Step 5: *To sign off the computer, the BYE command should be used.

An example of the above steps as they occur on a terminal is as follows:

```
Step 1:  SYSTEM?  FORT

         OLD OR NEW-OLD MASTER.P

         READY
         *LIST

         00010 PISRF4E.; 134
         00020 PISRRF4E;  10
         00030 PGREF4E.;  37
         00040 PTURF4E.;  41

         READY

Step 2:  *00050 PIRQF4E.; 50

Step 3:  *RESA MASTER.P
         DATA SAVED-MASTER.P

Step 4:  *LIST

         00010 PISRF4E.; 134
         00020 PISRRF4E;  10
         00030 PGREF4E.;  37
         00040 PTURF4E.;  41
         00050 PIRQF4E.;  50
```

Step 5: *BYE

CREATE off at 12.617

NOTE: If not already done, refer to paragraph 6 for instructions on building part/modification files.

NOTE: The above five steps must be accomplished for MASTER.M and MASTER.P

To accomplish via FORTRAN coding forms, code the new information in accordance with the proper format. Reference paragraph 7B and/or Figure C-1.

CASE 2: Changing a Country's Total Possessed Aircraft

To change a country's total possessed aircraft, the following steps are required by the terminal operator. Required responses to computer queries are underlined. As an example file MASTER.M is used and Greece's F-4E aircraft total is now 45.

Step 1: If desired, list the appropriate file as in paragraph 8. Otherwise, continue with Step 2.

Step 2: Type in the appropriate line number and follow the appropriate format. Reference paragraph 7B and/or Figure C-1. Your response for the above example should be *00030 MGREF4E.; 45.

Step 3: *. Resave the file under the same file name: *<u>RESA MASTER.M</u>.

Step 4: *. If you desire to re-list the file to check for correctness, your response should be: *<u>LIST</u>.

Step 5: *. To sign off the computer the <u>BYE</u> command should be used.

An example of the above steps as they occur on a terminal is as follows:

```
Step 1:  SYSTEM?  FORT
         OLD OR NEW-OLD MASTER.M

         READY
         *LIST

         00010 MISRF4E.; 134
         00020 MISRRF4E;  10
         00030 MGREF4E.;  37
         00040 MTURF4E.;  40

         READY

Step 2:  *00030 MGREF4E.; 45

Step 3:  *RESA MASTER.M
         DATA SAVED-MASTER.M

Step 4:  *LIST

         00010 MISRF4E.; 134
         00020 MISRRF4E;  10
         00030 MGREF4E.;  45
         00040 MTURF4E.;  40

         READY

Step 5:  *BYE

CREATE off at 12.684
```

NOTE: The above five steps must be accomplished for MASTER.M and MASTER.P.

To accomplish via FORTRAN coding form, code the new information in accordance with the proper format. Reference paragraph 7B and/or Figure C-1.

CASE 3: Deleting a Country from a Master File

To delete a country from a master file, the following steps are required by the terminal operator. Required responses to computer queries are underlined. As an example, master file MASTER.M is used and Greece (line number 00030) is to be deleted.

Step 1: If desired, list the appropriate file as in paragraph 8. Otherwise, continue with Step 2.

Step 2: *. The command to delete a line number is DELE followed by a space and the line number. Your response should be *DELE 00030.

Step 3: *. If desired, re-sequencing of line numbers (by fives, tens, etc.) may be accomplished in the following manner:

*RESE 00010,10. This will number the line numbers 00010, 00020, 00030, etc.

Step 4: *. Resave the file under the same file name. Your response should be *RESA MASTER.M.

Step 5: *. If you desire to re-list the file to check for correctness, your response should be *LIST.

Step 6: *. To sign off the computer, the BYE command should be used.

An example of the above steps as they occur on a terminal is as follows:

Step 1: SYSTEM? FORT

```
OLD OR NEW-OLD MASTER.M

READY
*LIST

00010 MISRF4E.; 134
00020 MISRRF4E;  10
00030 MGREF4E.;  45
00040 MTURF4E.;  40

READY
```

Step 2: *DELE 00030

Step 3: *RESE 00010,10

Step 4: *RESA MASTER.M
DATA SAVED-MASTER.M

Step 5: *LIST

```
00010 MISRF4E.; 134
00020 MISRRF4E;  10
00030 MTURF4E.;  40

READY
```

Step 6: *BYE

CREATE off at 12.762

NOTE: The above five steps must be accomplished for MASTER.P and MASTER.M.

NOTE: If not already done, the applicable part/ modification file(s) must also be released. Your response should be *RELE MGREF4E. for the above example.

To accomplish via FORTRAN coding form, code the new information in accordance with the proper format. Reference paragraph 7B and/or Figure C-1.

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